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ABSTRACT

Presented is the final report of the University of the Philippines evaluation of the summer science institutes and the implementation of science courses in secondary schools as components of the Science Education Project of the Philippines (SEPP). This evaluation of the SEPP science curriculum improvement project sought to assess student learning and attitudes within the project courses, to identify the program's strong and weak points, to identify problems encountered in implementation, to identify factors significant to efficient and successful implementation, and to identify desired program modifications. Extensive tabular data and appendices are provided. (SL)

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UP-NSDB PROJECT 7501 ED.

"EVALUATION OF THE EFFECTS OF THE RSTC PROGRAMS ON STUDENT PERFORMANCE"

BEST COPY AVAILABLE

FINAL REPORT
February, 1978

A PROJECT OF THE UNIVERSITY OF THE PHILIPPINES

FUNDED BY THE NATIONAL SCIENCE DEVELOPMENT BOARD

SE 024 365

FINAL REPORT

Project no. : UP-NSDB PROJECT 7501 ED.

Title of the Project : "EVALUATION OF THE EFFECTS OF THE
RSTC PROGRAMS ON STUDENT PERFORMANCE"

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I. EXECUTIVE SUMMARY

Introduction

The High School component of the Science Education Project of the Philippines (SEPP) consists of several phases starting with (1) the production of textbooks and other teaching materials, (2) the training of instructors for the Regional Science Teaching Centers (RSTC) in the University of the Philippines, (3) the Summer Science Institute (SSI) programs at the RSTC and finally, (4) the implementation of the science courses in the secondary schools. The National Science Development Board has been supporting the various phases of this program and has been, for the past seven years, the principal source of funding of the Summer Science Institutes. With financial assistance from the NSDB, the University of the Philippines embarked on this evaluation project with the last two above-mentioned phases as the primary targets.

For each of these two phases (SSI and High School Implementation) three classes of data were gathered; namely, antecedent data (conditions existing at the outset of each phase that may be related to the outcomes), transactions (the instructional, administrative aspects and other activities composing each phase), and outcomes (the identification of results of each phase).

Broadly, the evaluation project aimed to gather and analyze data which may provide answers to the following questions:

- (1) Do the SSI programs lead to:
 - (a) better learning of the students (cognitive)?
 - (b) more positive attitude and greater interest of the students toward science (affective)?

- (2) What are the strong and weak points of the SSI programs?
- (3) What problems are encountered in implementing the SSI programs and the science courses in the high schools?
- (4) What factors are significant to the efficient and successful implementation of the SSI courses and the science courses in the high schools?
- (5) If the SSI programs are to continue, what modifications are desirable?

The project started on April 1, 1975 under a Memorandum of Agreement executed between the University of the Philippines and the National Science Development Board. The First Progress Report was submitted in October, 1975; a Second Progress Report was released in April, 1976 and a Third Progress Report was submitted in September, 1976. The evaluation project hereby submits its final report.

Overview of the Evaluation Project

The evaluation project had two major targets from which information was gathered: (1) Summer Institute in the five RSTCs*, (2) High School Science Classes.

In January, 1976, the Working Committee of the SEPP requested the project to make a comparative study of the crash and sequential course programs in Chemistry. This necessitated the extension of the project to the Summer of 1977.

*St. Louis University, Baguio City; Aquinas University, Legaspi City; Silliman University, Dumaguete City; Ateneo de Davao, Davao City and Notre Dame of Marbel, Marbel, Cotabato.

Summer Science Institutes

During the Summer of 1975, the project fielded its evaluators in the five RSTCs to gather information on the following: (1) SSI Instructors, (2) Teacher Participants, (3) RSTC Administrators, and (4) the Program of Instruction for all five subject areas.** In the Summer of 1976, additional data were gathered from the SSI, particularly from the teacher participants attending their second summer session. The evaluation instruments administered in the SSI were designed to yield information on the following:

- (1) the perception of science course objectives by both the SSI instructors and the teacher participants,
- (2) problems that the SSI instructors encountered in implementing the courses,
- (3) the procedures followed by the RSTC administrators in selecting teacher participants,
- (4) the gain in knowledge by the teacher participants in each subject matter (using standard error of difference of scores and residual gains),
- (5) the identification of personal variables that could be used in the selection of teacher participants,
- (6) needs of the high school teachers upon their return to the schools,
- (7) desirable changes and/or modifications in the SSI course offerings and,
- (8) factors that may hamper the efficient and effective administration of the SSI programs.

**Physics, Chemistry, Biology, General Science and Mathematics.

Questionnaires were also sent to the 1971-1974 teacher participants of the various SSIs primarily to determine (1) the retention of the teacher trainees by their schools, and (2) the percentage of teachers who are still teaching the subject matter they were trained in.

A survey was likewise conducted on the MAT scholars sent to the University of the Philippines in the past to determine (1) their retention by the schools that sponsored them, and (2) the losses of the RSTCs of the MAT scholars in each subject area.

High School Setting

For each subject matter, Experimental classes (classes taught by teachers trained in the SSI) and Control classes were selected. From these two groups, information was gathered for one school year. Questionnaires and tests were administered which could yield information on the following:

- (1) comparative achievement test scores of the Experimental and Control groups. For purposes of placing the two groups on equal footing, the analysis of covariance was utilized. Mental Vocabulary Ability Test score of students was used as one of the covariates.
- (2) changes in attitude to and interest in science by the Experimental and Control groups,
- (3) problems encountered by the high school teachers in implementing the courses and in applying the teaching techniques learned in the SSI,
- (4) the "Degree of Implementation" of the topics, techniques, methodology and other teaching strategies that the teacher may have acquired from their training,

- (5) coverage of topics and experiments during the school year,
- (6) the identification of factors that may be able to predict the average achievement test score of each class. The "Learning Environment Scale" was developed for this purpose,
- (7) the reliability of the various achievement tests used for each subject matter.

In order to extract the information cited above, the evaluation project developed and administered a total of forty-four questionnaires, tests, and opinionnaires for the following groups of respondents:

	<u>Number</u>
(1) 1975 and 1976 RSTC Teacher Participants	19
(2) 1971 to 1974 RSTC Teacher Participants	1
(3) 1969 to 1974 MAT Scholars	1
(4) RSTC Administrators	1
(5) Summer 1975 RSTC Instructors	6
(6) High School Students	15
(7) High School Administrators	1
Total	44

All of the above instruments are to be found in the Appendix of this final report. Most of the data were analyzed with the aid of the Statistical Package for Social Sciences (SPSS) computer programs. A summary of the findings and recommendations are given in the next two sections.

Findings

Summer Science Institute

1. SSI Instructors and Courses

a. Ranking of Objectives. There was a high degree of agreement among the RSTC instructors of the different subjects in the ranking of objectives of science courses. Their opinions are in consonance with the hierarchy of objectives advocated by recognized science educators.

b. Problems Encountered. Among the problems cited by the RSTC instructors, the more serious ones are the following:

- (1) the insufficiency of time to cover the materials in the syllabus and
- (2) the inadequate background of the participants in the content areas

This is most critical in Physics and Chemistry as confirmed by the results of the cognitive tests administered to the participants at the start of the summer institute.

c. Course Content and Coverage. The Centers differ in the way they conduct the summer institute training; in subject matter coverage and in other requirements. Imposition of too many requirements unduly burdened the participants that they felt discouraged and unwilling to return for a second summer. Examples of these requirements are:

- (1) sample letters inviting consultants, resource persons, judges of contests and the like,

- (2) design of a science fair exhibit,
- (3) five abstracts of research articles, and five abstracts of opinion articles.
- (4) budget of a workshop conference:
 - (a) school (c) district
 - (b) municipal (d) provincial

d. Retention of MAT Scholars. The RSTCs sent participants to the MAT programs in the UP College of Education from 1969-1975. In summer of 1975, a survey was made to find out the number of trainees who are still with the RSTC. It was found that among the RSTCs, Notre Dame of Marbel has the lowest percentage retention of 64.25%, followed by St. Louis University with 66.66%, then Ateneo de Davao with 77.77%, Silliman University with 80% and Aquinas University with 85.71%.

To determine the losses of the MAT trainees in each area, the percentage retention per subject area was studied. Physics suffered most having a very low percentage of retention of only 44%, then Chemistry, 57%, General Science, 77%, Mathematics, 78% and 100% for Biology. This indicates that most of the staff members who left the RSTCs are those trained in Physics and Chemistry.

2. Teacher Participants

- a. Gain in Subject Matter Knowledge. Using the standard error of difference of scores, 72% of the Chemistry trainees showed marked improvement in their knowledge of the subject matter, followed by

Physics with 59.60%, then by General Science with 43.16%, by Biology with 18.95% and finally by the Mathematics participants with only 8.16%. The training of Chemistry and Physics teachers in the four centers (Silliman excluded) reached a certain degree of success. However, the programs should still be improved because the average percentage means of scores in the posttest of the Chemistry and Physics trainees were only 58.65% and 58.91% respectively. As teachers, they should have a better mastery of the subject matter. For Mathematics and General Science, the results of the test on subject matter are questionable because the subject matter taken up in some Centers were not those anticipated by the evaluators.

- b. Predictors and Selection Variables. For each subject, the best predictors of the posttest achievement test scores of the teacher participants were determined using the results of all the teachers in four centers. In the selection of participants for each subject, it is advisable to consider the following posttest predictors:

Physics:	Minor, major, kind of school (in favor of private schools)
Chemistry:	Major, sex, (in favor of females), kind of school (in favor of public schools), previous use of UPSEC materials
Biology:	Previous use of UPSEC materials, minor, sex, (in favor of males).
General Science:	Years of teaching, previous use of UPSEC materials.

Mathematics:	Years of teaching Mathematics, major, sex (in favor of females), previous use of UPSEC materials.
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c. Long-Term Effect of Training. To determine the teacher participants' perception of the long-term effects of the training on them, the Science Training Inventory (Form A-5) was administered to them nine months after attending the summer institutes. The participants felt that their training in the summer institutes made them better teachers. They also felt that their training generally improved their understanding of the subject, their laboratory skills and teaching techniques. While this may be true, considering the teacher participants' posttest achievement scores and the problems they encounter in the field, it is felt that the courses should still be looked into more closely. The Physics and Chemistry participants felt they received better training as compared with the trainees of the other subjects as in Biology. These would probably be due to the fact that they had greater need for training in the subject matter as shown by their pretest scores.

d. Retention of Teacher Participants. A survey of the 1971-1974 teacher participants showed the following percentage of teachers who responded still connected with their sponsoring schools:

1971 Physics participants	-	71%
1971 Chemistry participants	-	64%
1972 Biology participants	-	79%
1972 General Science participants	-	78%
1972 Mathematics participants	-	78%
1974 Physics participants	-	81%
1974 Chemistry participants	-	84%

The survey shows that majority of the teacher trainees are still connected with the school which sent them to the SSI.

Some SSI participants did not teach the subject that they trained in right after the in-service program. This was true for 16% of the 1971 Chemistry participants, 6% of the 1972 Biology participants, 9% of the 1972 General Science participants, 7% of the 1972 Mathematics participants and 4% of the 1974 Chemistry participants. Among the reasons cited for this are:

- (1) greater demand for teachers in other subjects,
- (2) changes in the curriculum,
- (3) transfer to another school or job.

- e. Ranking of Objectives. The Summer 1976 Teacher Participants changed their ranking on two objectives of science teaching from the pretest to the posttest administration. The objective "Ability to recall important facts, laws and theories" was ranked 4th in the pretest and became 9th (lower) in the posttest. The objective "To develop skills derived from laboratory manipulation of common science apparatus" was ranked 6th in the pretest and became 2nd (higher) in the posttest. This indicates desirable changes in the perception of objectives of science teaching by the participants.

High School Setting

1. Student Achievement

The impact of summer institute training of teachers on student achievement was measured by contrasting the performance of high school students taught by the trainees (Experimental group) with those taught by non-trainees (Control group). Analysis of covariance was utilized to compare the two groups. Significantly higher achievement of the experimental groups were found in the following subjects:

- (a) Physics; level of significance is 0.007
- (b) Chemistry; level of significance is 0.01
- (c) Mathematics; level of significance is 0.05

Although not significant, the achievement of the Experimental groups in Biology ($\alpha = .18$) and General Science ($\alpha = .12$) were also higher.

2. Student Attitudes and Interest

The attitudes of the Experimental group of students were contrasted with those in the Control students on certain aspects of the science courses they were taking.

The following results were found:

- (a) For Physics and Chemistry, the improvement of attitude toward science in the Experimental groups were significantly higher than those of the Control groups. The levels of significance were: 0.02 for Physics and 0.05 for Chemistry. No significant differences were found for the other subjects (Biology, General Science and Mathematics).

- (b) It is only in Physics ($\alpha = 0.05$) where the appreciation for the role that science play in their daily lives was significantly higher among the students of the Experimental group as compared with those of the Control group.
- (c) Physics students of the Experimental group found the subject significantly more interesting ($\alpha = 0.05$) than their counterparts in the Control groups. No significant differences were found in the other subjects.
- (d) The students of Physics and Biology in the Experimental group attach greater importance to their subjects than the corresponding students in the Control group. The levels of significance are 0.10 and 0.05 respectively. No significant differences were found in the other subjects.
- (e) In the overall attitude toward science, no significant change was found during the one school year (1975-76) among the Experimental and Control group.

In all the above cases, there was no instance where the Control group was significantly higher than the Experimental group.

3. Experiments Performed

A survey of the experiments conducted by the different science classes showed a rather low percentage of performance of the required number of experiments. For Physics, it is only 44.52%; for Chemistry, 39.94%; for Biology, 43.7% and for General Science, 35.65%.

This low percentages may be attributed to:

- (a) lack of equipment and supplies
- (b) lack of time to perform the experiments
(required number of experiments could be
excessive and unrealistic)
- (c) inadequate laboratory skills of the
teacher

4. Degree of Implementation

The computed degree of implementation for each subject area are: Physics, 93.7; Chemistry, 91.3; Mathematics, 91.03; Biology, 83.7; and General Science, 78.1. The maximum possible score is 120. Analysis of variance performed showed significant differences in at least one pair of these values. The Scheffe method of multiple comparison revealed no significant differences in the degree of implementation among Physics, Chemistry and Mathematics. There is no significant difference between Biology and General Science. This means that Physics, Chemistry and Mathematics differ significantly from Biology and General Science.

A multiple correlation between the degree of implementation and six variables (support from administrators, amount of equipment available, years of teaching by the teachers, total posttest score, number of students with textbooks, and residual gains of the participants) was performed. The results showed that the amount of equipment available and support from administrators have greater correlation with the degree of implementation than the other variables. Of the

four remaining variables, total posttest score and residual gains have lower correlation coefficients with the degree of implementation than years of teaching and number of students with textbooks.

Instruments

Three instruments which were developed particularly for this evaluation project and could possibly be further developed are briefly described below.

1. Interest in Science Scale (Form F-7)

This instrument was found to be one of the most useful instruments developed for study. The scale correlated relatively high with student achievement and low with mental ability scores. The instrument has great potential for predicting student achievement.

2. Mental and Vocabulary Ability Tests (Form F-4)

Two forms of this test were constructed; Form A for Freshmen and Sophomore high school students and Form B for Junior and Senior high school students.

Both instruments were found to:

- (a) Possess high validity for predicting student achievement in the different science subjects. The following correlations were obtained: 0.55 for Physics, 0.47 for Chemistry, 0.61 for Biology and 0.41 for General Science. They are all significant at the 0.01 level. For Mathematics, the correlation obtained was 0.29. This is not significant.

- (b) Form A was able to discriminate between the first and second year high school students ($\alpha = 0.01$). This is additional evidence of the validity of the test.
- (c) Form B was able to discriminate between the third and fourth year high school students ($\alpha = 0.01$). Again, this is additional evidence of the validity of the test.
- (d) Form B was found to be a biasing factor between the Experimental and Control groups for both third and fourth year students. The instrument scores can therefore be used as covariate in the analysis of variance (or in attempting to place the Experimental and Control groups on equal footing).

3. Learning Environment Scale (Form F-5)

Several factors included in the "Learning Environment Scale" (LES) were found to be significantly correlated with the class mean Achievement Test scores of the students. Various factors may be used as predictors of achievement test in different subjects. With the addition of the eight factors in the LES to the Mental Vocabulary Ability Test Scores, the multiple correlations with the achievement test were raised significantly beyond the correlations with Mental Vocabulary alone. Predictability of the achievement test scores are therefore considerably enhanced with the use of the LES. Multiple regression equations for predicting the average class Achievement Test

Scores are reported and can possibly be used for diagnostic purposes even as early as the first quarter of the school year.

RECOMMENDATIONS

1. Increase the number of MAT scholarship slots for Physics and Chemistry.
2. There is a need for the funding agency to find means for greater coordination among the RSTC instructors on such aspects as the following:
 - a) working objectives of the SSI;
 - b) the detailed plans as to how these objectives could best be accomplished;
 - c) the various approaches in their teaching that would achieve maximum results;
 - d) requirements and other aspects of the training that have direct bearing on the goals of the SSI.
3. For Biology, training should be geared more towards teaching innovations and enrichment topics. Instructors in the SSI should be encouraged to use biological materials available in the immediate environment.

For Mathematics, the course should include additional topics which can serve as review or enrichment materials for the teachers.
4. Continue with the sequential Physics summer institute with emphasis on basic concepts and principles and the improvisation of simple equipment. The sequential Chemistry summer institute should also be continued with emphasis not only on basic concepts and

principles but also on important laboratory techniques, proper experimental set-ups, and familiarity with sources of common chemicals.

5. The course objectives of the SSI courses should be made explicit for all subjects.
6. The procurement of equipment and supplies is essential for a more effective science program. It is therefore recommended that positive steps be taken in this direction:
 - (a) Additional funding to needy high schools for equipment and supplies.
 - (b) Emphasize the need for basic equipment and supplies during administrators conference.
7. Further development and testing of the Mental Vocabulary Ability Tests (Form F-4) could be undertaken. An improved version would serve as test of mental ability and as substitute for the more expensive standardized IQ tests.
8. The Interest in Science Scale (Form F-7) could further be improved to increase its reliability and validity. This is a potentially good instrument for predicting student achievement in science.
9. With the strong promise of the Learning Environment Scale (Form F-5) as a predictor of Achievement Test Scores and as a diagnostic tool, it should be developed and tested further. With adaptations, this instrument could even be useful in the Social Sciences and in the college and elementary levels. LES is highly recommended to be used in combination with IQ tests or other measures of mental ability.

II. DETAILS OF FINDINGS

Summer Science Institutes

1. RSTC Instructors

a. Ranking of Objectives.

The 1975 RSTC instructors were asked to rank ten science teaching objectives (Form E-2) according to their belief as to the importance of each objective. The objectives are listed below:

- (a) Ability to recall important facts, laws and theories of science.
- (b) Knowledge of the methods (induction, deduction, etc.) scientists use to discover and validate knowledge in science.
- (c) Knowledge of the cultural and historical aspects of science.
- (d) Ability to interpret, analyze and apply the topics covered in science.
- (e) Increased understanding and approval of the role of the scientists in our culture.
- (f) To develop skills derived from laboratory manipulation of common science apparatus.
- (g) Ability to use some general techniques of data analysis such as: consideration of errors, numerical statistics, and graphical display.
- (h) Increased interest in science as evidence by outside reading and discussion about topics in science.

- (i) Acquire a positive attitude toward science in general.
- (j) Acquisition of the characteristics (curiosity, openmindedness, skepticism, etc.) of a good scientist.

The resulting rank order for the instructors categorized according to subject taught were obtained by assigning weights from one to ten for each position that a certain objective might occupy (an objective ranked first receives one point, etc.) The frequency of occurrence of a given objective is multiplied by its rank number. The sum of these products for each objective is taken. These sums were ranked again, the lowest value (and most important) is assigned a rank of one.

Discussion of Results

Table 1

Ranking of Objectives by the Different Science Instructors

Subject	Objectives									
	a	b	c	d	e	f	g	h	i	j
Physics	9	4.5	7	1	10	8	3	4.5	6	2
Chemistry	9	3	10	1	8	7	4	6	5	2
Biology	10	3	9	1	8	6	2	7	5	4
Gen. Science	9	2	10	1	8	3.5	6	7	5	3.5
Overall Ranking	10	3	9	1	8	6.5	4	6.5	5	2

Objective "d" (ability to interpret, analyze and apply topics covered in the science courses) was judged most important, followed by objective "j"

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To determine whether the values of the different tau's are significant or not, a z-test was performed. Table 2 is a summary of the r values and the corresponding z values together with the level of significance (p).

All results show significance beyond the .05 level. This indicates a high degree of agreement among instructors of the different natural sciences, particularly between Chemistry and Biology instructors.

b. Use of UPSEC Materials

A majority (68.25%) of the instructors based their syllabi on UPSEC materials although some found the syllabi of previous summer institutes helpful. More than half (62.79%) of the instructors did not strictly follow the syllabi they prepared. The modifications they made were in terms of:

- (1) adjusting the time allotted for specific areas
- (2) putting emphasis on certain topics depending upon the needs of the participants
- (3) cutting down on micro-teaching demonstrations
- (4) devoting more time to laboratory activities
- (5) inviting resource persons to speak before the participants.

c. Problems Cited by RSTC Instructors.

The instructors were given a list of problems encountered in the summer institutes and they rated each item using a 3-point scale. An item considered as a very serious problem was rated 3, somewhat of a problem 2, and not a problem 1. The weighted mean of each item was taken. Below is a list of problems and their weighted means.

Table 3
Problems Encountered by RSTC Instructors

Problem	Weighted Mean, Wmn
(1) Time to cover materials is insufficient.	2.00
(2) Poor subject matter background of teachers.	1.98
(3) Laboratory facilities are inadequate.	1.30
(4) Equipment for laboratory exercises are inadequate and not functioning properly.	1.30
(5) Difficulty of getting clerical help.	1.27
(6) Needed supplies and materials are not available.	1.23
(7) Needed teaching aids are not available.	1.21
(8) Library resources are insufficient.	1.19
(9) Lack of support of RSTC administrators.	1.02
(10) Lack of support of University administrators.	1.00

The results show that the items which posed as problems to the instructors were: (1) insufficiency of time to cover instructional materials ($W_{mn} = 2.00$), and (2) poor subject matter background of teachers ($W_{mn} = 1.98$). The latter problem could be one of the reasons why instructors' timetables are not met.

d. MAT Participants.

Data about the MAT programs and MAT participants were gathered through questionnaires sent to the participants of 1969-1974, to the Summer 1975 RSTC instructors, and to the RSTC administrators, (see Forms C-1, D-1 and E-1).

There were 114 participants of 1969-1974 who were sent questionnaires and of these only 58 responded. Not all of these 58 respondents are from the RSTCs.

Of those who responded only 40 are MAT graduates with the following majors: 12 in Mathematics, 7 in Biology, 11 in General Science, 5 in Physics and 5 in Chemistry. A few received certificates and the rest still have to submit their seminar papers.

While on scholarship, the participants were extended the following privileges by the RSTCs:

- (1) 46% got free transportation to and from residence to U.P. Diliman.
- (2) 41% received full salary
- (3) 10% received half of their salary
- (4) 21% received difference of salary and stipend
- (5) 2% were given book allowance

Upon their return to the RSTC after the MAT program, 74% got an increase in salary and 62% were promoted in rank.

Table 4 shows the activities of the 58 participants when they returned to the RSTCs.

Table 4
Activities of the MAT Returnees
(1969-1974)
n = 58

Functions	Frequency	Percentage
1. Followed up teacher participants of SSI	15	25.8%
2. Evaluated echo seminars	17	29.3%
3. Taught graduate courses	39	67.2%
4. Taught undergraduate courses	58	100.0%
5. Did research work	13	22.4%
6. Did administrative work	23	39.6%
7. Became a resource person	5	8.6%
8. Conducted in-service programs	39	67.2%
9. Wrote/revised curriculum materials	3	5.1%

Note that all the respondents taught undergraduate courses and almost 70% of them taught graduate courses and conducted in-service programs. It should be mentioned that since 1969, only 49 of the MAT participants came from the RSTCs. The rest are from other schools which are satellites of the RSTCs. This explains why only 70% conducted in-service programs.

Since one of the aims of the MAT program is to strengthen the faculty of the RSTCs, the number of returned MAT scholars who are still with the

RSTCs was determined. Table 5 shows the breakdown of the number of faculty members sent by the RSTCs in each subject area from 1969 to 1974.

Table 5
Number of Teachers Sent by the RSTCs to the
MAT Program

RSTC	No. of teachers sent					Total	No. of teachers still with RSTC					Total
	Physics	Chemistry	Biology	General Science	Mathematics		Physics	Chemistry	Biology	General Science	Mathematics	
St Louis University	1	1	2	3	2	9	0	0	2	2	2	6
Aquinas University	1	1	1	1	3	7	1	1	1	1	2	6
Silliman University	2	2	2	1	3	10	2	1	2	0	3	8
Ateneo de Davao	1	1	1	3	3	9	0	1	1	3	2	7
Notre Dame of Marbel	4	2	4	1	3	14	1	1	4	1	2	9
Total	9	7	10	9	14	49	4	4	10	7	11	36

Tables 6 and 7 show the percentage of MAT participants still with the RSTC and per subject area respectively.

Table 6
Percentage of MAT Participants Still With
the RSTCS

RSTC	Percentage of Participants Still with RSTC
Aquinas University	85.71%
Silliman University	80.00%
Ateneo de Davao	77.77%
St. Louis University	66.66%
Notre Dame of Marbel	64.28%

Table 7
Percentage of MAT Participants Per Subject
Area

Subject	Percentage of Participants Still with RSTC
Biology	100%
Mathematics	79%
General Science	78%
Chemistry	57%
Physics	44%

The percentage retention of the Centers range from 64% to 86% with St. Louis University and Notre Dame of Marbel losing more than the other three Centers.

Table 7 shows that both Physics and Chemistry have quite low percentage retention by the RSTCs. A number of Centers therefore often have to invite Physics and Chemistry Instructors from other schools to conduct their in-service training program.

Table 8 shows the distribution of the SSI faculty as to whether they are regular RSTC faculty or are guest instructors.

Table 8
Number of Regular and Guest Instructors

Subject Area	Membership at RSTC Faculty		
	No. of Respondents	Regular faculty of RSTC	Invited
Physics	7	3	4
Chemistry	10	6	4
Biology	9	7	2
General Science	8	5	3
Mathematics	7	7	0

On the average, about 30% of the instructors at the SSI are guest instructors. They are not regular faculty members of the RSTC. Most of these guest instructors were attracted to teach in the RSTC in order to have a change of environment and because of the privileges extended to them such as free transportation, free board and lodging and high honorarium.

2. Teacher Participants

a. Teacher Personal Data.

The teacher participants were asked to respond to a questionnaire on their personal data, (Form A-4). Information on the teachers' background such as age, sex, educational background, teaching experience and previous use of UPSEC materials were gathered. These variables were analyzed to find their relationship with the teachers' success in the training and in the implementation of the program.

In the following pages, the teacher variables per subject per Center are tabulated. The following codes were used for each variable.

<u>Variable</u>	<u>Code</u>
(1) Sex	1 = Male 2 = Female
(2) Age	Actual Number of Years
(3) Years of Teaching the Subject	Actual Number of Years
(4) Previous Use of UPSEC Materials	1 = No 2 = Yes, As Reference 3 = Yes, As Supplement 4 = Yes, As Textbook
(5) Major Subject	1 = Non-Science 2 = Science, Engineering, Technical but not the Subject being Taught 3 = Same as Subject Taught
(6) Minor	1 = Non-Science or No Minor 2 = Any Science or Mathematics
(7) Kind of School	1 = Public 2 = Private
(8) Number of Students per Class	Actual Number of Students

Tables 9 to 13 show the teacher profiles for each subject in each RSTC. Tables 14 to 18 show the teacher profiles for each subject in all four Centers combined.

Table 9

Teacher Profile for Physics (1975 Participants)

Variables	St. Louis University n = 20		Aquinas University n = 23		Ateneo de Davao n = 17		Notre Dame of Marbel n = 14	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Sex	1.55	0.51	1.74	0.45	1.32	0.39	1.57	0.52
Age	31.55	7.34	31.83	7.54	28.41	4.76	29.36	6.97
Kind of School	1.45	0.51	1.48	0.51	1.53	0.51	1.79	0.42
Major	1.95	0.22	2.04	0.21	2.00	0.35	2.00	0.00
Minor	1.80	0.41	1.26	0.45	1.47	0.51	1.14	0.36
Number of students per class	45.20	6.68	47.43	6.51	41.06	7.46	45.14	5.45
Previous use of UPSEC materials	3.10	1.41	2.83	1.15	3.41	1.00	3.36	1.01
Years of teaching Physics	7.75	3.51	4.35	2.93	3.88	2.70	4.50	4.31

Table 10

Teacher Profile for Chemistry (1975 Participants)

Variables	St. Louis University n = 19		Aquinas University n = 18		Ateneo de Davao n = 16		Notre Dame of Marbel n = 15	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Sex	1.89	0.31	1.94	0.24	1.75	0.45	1.87	0.35
Age	29.00	4.48	28.78	6.48	29.38	4.70	28.97	5.68
Kind of school	1.57	0.51	1.33	0.49	1.69	0.48	1.93	0.26
Major	2.00	0.58	2.11	0.58	1.94	0.57	2.20	0.56
Minor	1.53	0.51	1.50	0.51	1.38	0.50	1.53	0.52
Number of students per class	44.47	6.01	49.06	5.59	45.44	3.76	46.07	5.66
Previous use of UPSEC materials	3.53	1.02	3.72	0.67	3.56	0.73	3.47	0.92
Years of teaching Chemistry	3.37	2.11	2.28	1.13	3.25	2.77	1.73	1.39

Table 11
Teacher Profile for Biology (1975 Participants)

Variables	St. Louis University n = 23		Aquinas University n = 23		Ateneo de Davao n = 19		Notre Dame of Marbel n = 20	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Sex	1.87	0.34	1.87	0.34	1.89	0.32	1.70	0.47
Age	29.00	7.12	30.04	8.36	27.32	3.51	30.05	7.18
Kind of school	1.52	0.51	1.48	0.51	1.68	0.48	1.65	0.49
Major	2.65	0.71	2.57	0.66	2.79	0.42	2.30	0.66
Minor	1.30	0.47	1.22	0.42	1.16	0.17	1.30	0.47
Number of students per class	43.61	9.33	49.26	5.63	45.53	3.82	46.15	5.32
Previous use of UPSEC materials	2.87	1.14	3.43	0.99	3.05	0.91	3.25	1.21
Years of teaching Biology	5.26	4.42	6.65	4.81	5.32	2.26	5.10	3.67

Table 12
Teacher Profile for General Science (1975 Participants)

Variables	St. Louis University n = 17		Aquinas University n = 19		Ateneo de Davao n = 22		Notre Dame of Marbel n = 25	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Sex	1.76	0.44	1.89	0.32	1.82	0.39	1.64	0.37
Age	30.57	7.15	32.32	8.03	32.36	15.47	28.36	3.74
Kind of school	1.59	0.51	1.37	0.50	1.77	0.43	1.63	0.48
Major	2.18	0.73	2.32	0.75	1.95	0.79	2.40	0.87
Minor	1.41	0.51	1.32	0.43	1.45	0.51	1.64	0.49
Number of students per class	44.24	7.14	50.26	8.46	43.05	5.31	45.92	6.21
Previous use of UPSEC materials	2.82	1.29	2.00	1.29	2.09	1.31	2.48	1.33
Years of teaching General Science	5.53	4.17	1.37	5.93	5.50	4.16	4.20	2.76

Table 13

Teacher Profile for Mathematics (1975 Participants)

Variables	St. Louis University n = 18		Aquinas University n = 17		Ateneo de Davao n = 19		Notre Dame of Marbel n = 24	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Sex	1.78	0.43	1.77	0.44	1.79	0.42	1.75	0.45
Age	29.39	7.19	32.00	8.15	28.68	6.22	28.75	4.86
Kind of School	1.67	0.49	1.59	0.51	1.68	0.48	1.83	0.39
Major	2.67	0.69	2.65	0.79	2.68	0.75	2.33	0.98
Minor	1.61	0.50	1.29	0.47	1.37	0.50	1.42	0.51
Number of students per class	43.50	8.35	46.06	9.33	46.37	5.50	42.67	11.15
Previous use of UPSEC materials	2.28	1.32	1.82	1.01	1.68	1.11	2.42	1.31
Years of teaching Mathematics	3.39	2.66	4.76	5.58	3.74	3.31	4.83	3.66

Table 14

Physics Teacher Profile for All Four Centers Combined
n = 74

Variables	Mean	S.D.	Standard Error of Mean
Sex	1.67	0.47	0.05
Age	30.50	6.48	0.75
Kind of school	1.54	0.50	0.06
Major	2.00	0.23	0.03
Minor	1.43	0.50	0.06
Number of students per class	44.93	6.87	0.79
Previous use of UPSEC materials	3.14	1.17	NA*
Years of teaching Physics	5.19	3.63	0.42

*Not applicable. Distribution of books in previous years may differ.

Table 15

Chemistry Teacher Profile for All Four
Centers Combined
n = 68

Variables	Mean	S.D.	Standard Error of Mean
Sex	1.87	0.34	0.04
Age	29.00	5.27	0.64
Kind of school	1.62	0.49	0.06
Major	2.06	0.57	0.07
Minor	1.49	0.50	0.06
Number of students per class	46.26	5.54	0.67
Previous use of UPSEC materials	3.57	0.83	NA*
Years of teaching Chemistry	2.69	2.02	0.24

*Not applicable.

Table 16

Biology Teacher Profile for All Four
Centers Combined
n = 85

Variables	Mean	S.D.	Standard Error of Mean
Sex	1.84	0.37	0.04
Age	29.15	6.86	0.74
Kind of school	1.58	0.50	0.05
Major	2.57	0.64	0.07
Minor	1.25	0.43	0.05
Number of students per class	46.16	6.72	0.73
Previous use of UPSEC materials	3.15	1.07	N.A.*
Years of teaching Biology	5.61	3.97	0.43

*Not applicable.

Table 17
General Science Teacher Profile for
All Four Centers Combined
n = 83

Variables	Mean	S.D.	Standard Error of Mean
Sex	1.83	0.38	0.04
Age	30.78	9.62	1.05
Kind of school	1.61	0.49	0.05
Major	2.22	0.80	0.09
Minor	1.47	0.50	0.05
Number of students per class	46.07	7.07	0.78
Previous use of UPSEC materials	2.34	1.32	N.A.*
Years of teaching General Science	5.54	4.37	0.48

*Not applicable.

Table 18
Mathematics Teacher Profile for
All Four Centers Combined
n = 66

Variables	Mean	S.D.	Standard Error of Mean
Sex	1.77	0.42	0.05
Age	29.74	6.81	0.83
Kind of school	1.68	0.47	0.06
Major	2.61	0.78	0.10
Minor	1.42	0.50	0.06
Number of students per class	44.83	8.46	1.06
Previous use of UPSEC materials	2.02	1.20	N.A.*
Years of teaching Mathematics	4.11	3.90	0.48

*Not applicable.

Discussion of Teacher Profile

The teacher profile is a general description of the teacher participants' personal variables that might be related to their performance and their students' achievement in the subject area they are teaching. These characteristics are peculiar to the RSTC participants for the summer of 1975. To apply these characteristics to the 1971 to 1974 teacher participants, the standard error of means for each variable are given in the third column of Tables 14 to 18. The detailed description below is intended to provide the reader with the proper perspective when making judgments about the RSTC participants' training and subsequent performance in the field.

The majority of the participants are females. It is only in Physics where the ratio of female to male is 2 to 1. In Biology, Chemistry and General Science, the ratio is 4 to 1 in favor of the females. In Mathematics, the ratio is 3 to 1. The average age of participants is 30 years with teaching experience of approximately six years.

Previous to their coming to the summer institute, the Chemistry participants made use of the UPSEC book mostly as a text and as a supplement to the text; UPSEC materials were also used by Physics and Biology teachers but to a lesser extent than the Chemistry teachers. Mathematics and General Science teachers used UPSEC materials mostly as references.

It is in Mathematics and Biology where the great majority of teachers are teaching their major subjects in college. A major in Physics is, for all practical purposes, not existent among the teacher participants.

In General Science and Chemistry, there are only a few majors teaching the subject.

There are more participants coming from the private schools as compared to those from the public schools. The ratio is approximately 5 to 3. This perhaps reflects the fact that there are more private secondary schools than there are public high schools. On the average, there are 46 students per class in the secondary schools where the teacher participants are teaching.

The personal data of the teacher participants were extracted mainly for use as possible predictors of their pretest and posttest scores in the achievement test in each subject area. Personal data can be used for selection purposes. The variables in the teachers' personal data that are significant predictors of their posttest scores in the cognitive test were identified and reported on page 53 of this report.

b. Analysis of Achievement Tests.

Achievement tests were administered as pretest and posttest to the summer 1975 teacher participants of all five subject areas (Form A-2). The items in each test were based on the contents of the UPSEC books. For the Physics test, there were 60 items; for Chemistry, 50 items; for Biology, 50 items; for General Science, 46 items; and for Geometry, 30 items. The General Science test was based on the Integrated Science Book of UPSEC. The

evaluation group was informed that the Geometry (Mathematics III) and the Integrated Science books of UPSEC would be used for the SSI courses of Summer 1975.

There was a total of 710 respondents from four Centers. The test questions did not arrive on time for the pretest in Silliman University. The release of funds for this project was delayed and members of the evaluation team could not travel on time to bring the materials. All materials for the pretest were sent through a third party.

Both pretest and posttest of all subjects in four Centers were corrected and analyzed. Four methods of analyses were used.

- (1) The t-test to find out significant changes for each group.
- (2) The residual gain scores.
- (3) The standard error of difference of scores.
- (4) Correlational study of the scores with teacher personal variables leading to a multiple regression.

The mean standard deviation, actual gain, residual gain, and t-values for each subject are given in Tables 19 to 23.

Table 19

Mean, S.D., Residual Gains, t-values and Level of Significance (p) of the Pretest and Posttest in Physics

RSTC	X PRETEST		Y POSTTEST		Mean Actual Gain	Mean Residual Gain	t-values (Between Pre and Posttest)	p
	Mean Score	S.D.	Mean Score	S.D.				
St Louis University	26.54	6.19	37.84	8.38	11.30	-0.20	6.35	< .01
Aquinas University	22.14	5.32	30.88	8.59	16.74	3.60	11.05	< .01
Ateneo de Davao	20.41	6.12	32.10	8.77	11.69	-1.28	7.79	< .01
Notre Dame of Marbel College	21.76	5.65	32.57	6.75	10.81	-2.84	7.59	< .01

Maximum score for pre and posttests = 60.

Table 20

Mean, S.D., Residual Gains, t-values and Level of Significance (p) of the Pretest and Posttest in Chemistry

RSTC	X PRETEST		Y POSTTEST		Mean Actual Gain	Mean Residual Gain	t-values (Between Pre and Post Test)	p
	Mean Score	S.D.	Mean Score	S.D.				
St Louis University	15.40	3.42	22.96	5.25	7.56	-6.11	7.21	< .01
Aquinas University	17.35	5.72	29.95	6.21	12.60	0.34	7.93	< .01
Ateneo de Davao	16.76	3.92	31.87	5.67	15.11	2.52	12.83	< .01
Notre Dame of Marbel College	14.76	4.19	32.52	4.44	17.76	3.83	16.93	< .01

Maximum score for pre and posttests = 50.

Table 21

Mean, S.D., Residual Gains, t-values and Level of Significance (p)
of the Pretest and Posttest in Biology

RSTC	X PRETEST		Y POSTTEST		Mean Actual Gain	Mean Residual Gain	t-values (Between Pre and Post Test)	p
	Mean Score	S.D.	Mean Score	S.D.				
St. Louis University	36.54	6.57	41.20	4.60	4.66	0.54	4.89	<.01
Aquinas University	40.50	5.13	42.21	4.89	1.71	-0.41	2.59	<.01
Ateneo de Davao	37.41	5.73	39.58	4.92	2.17	-1.37	2.85	<.01
Notre Dame of Marbel College	37.38	5.79	43.54	3.64	6.16	2.76	6.25	<.01

Maximum score for pre and posttests = 50.

Table 22

Mean, S.D., Residual Gains, t-values and Level of Significance (p)
of the Pretest and Posttest in General Science

RSTC	X PRETEST		Y POSTTEST		Mean Actual Gain	Mean Residual Gain	t-values (Between Pre and Post Test)	p
	Mean Score	S.D.	Mean Score	S.D.				
St. Louis University	22.50	6.42	28.26	4.80	5.76	-0.72	3.20	<.01
Aquinas University	22.25	5.25	29.58	3.93	7.33	1.06	6.65	<.01
Ateneo de Davao	23.29	6.55	29.25	6.09	5.96	0.22	6.29	<.01
Notre Dame of Marbel College	22.52	6.98	28.36	6.29	5.84	-0.27	4.97	<.01

Maximum score for pre and posttests = 46.

Table 23

Mean, S.D., Residual Gains, t-values and Level of Significance (p)
of the Pretest and Posttest in Mathematics

RSTC	X		Y		Mean Actual Gain	Mean Residual Gain	t-values (Between Pre and Post Test)	p
	PRETEST Mean Score	S.D.	POSTTEST Mean Score	S.D.				
St. Louis University	16.26	4.16	20.00	3.60	3.74	0.84	5.68	< .01
Aquinas University	15.00	4.15	19.51	4.30	4.51	1.41	7.46	< .01
Ateneo de Davao	15.12	4.05	17.69	3.79	2.57	-1.00	4.79	< .01
Notre Dame of Marbel College	16.30	4.84	18.68	3.83	2.38	-0.56	3.27	< .01

Maximum score for pre and posttests = 30

Discussion of Results of the Tests

Before analyzing the results in Tables 19 to 23 a few guidelines are given on how to interpret the data.

General Guide to the Interpretation of Tables 19 to 23.

- (1) Since the cognitive tests administered to the participants are not standardized tests, and no norms have yet been established for them, the individual scores can only be compared against the others who took the same test at the same time. For instance, an individual who scored 40 in a Physics test where the mean is 33 and the standard deviation is 7 surpasses 84% of his group and is surpassed by 16% of his group.

- (2) A large standard deviation indicates heterogeneity of the group in terms of their ability to answer the examination questions. A small standard deviation implies homogeneity of the group.
- (3) The actual gain is the numerical difference between the posttest and the pretest. To determine whether these gains are statistically significant, a t-test for correlated data was used. The t-values obtained are then compared with the respective critical values and probability decisions are made. A probability (p) of less than 0.01 is interpreted to mean that the probability that the difference between the pretest and the posttest means could be due to chance is only one in a hundred.
- (4) The residual gain (RG) is a measure of how much has been learned that is unrelated to initial performance. A large positive value of RG would indicate superior RSTC training.

1. t-test

A one-tailed t-test for dependent samples was performed on the pretest and posttest scores. The null hypothesis was rejected at the 0.01 level of confidence for all fields in all four Centers. This means that all groups had significant changes in score and that these gains could hardly have been due to chance. These results of the t-test are, at first glance, very encouraging. However, these results on the pretest and posttest are to be subjected to other types of statistical analyses. The

test only shows if the change in score of each class is significant as a group. The t-values obtained for each class indicates the extent of change.

The results of the tests also show the level of mastery the teachers have attained after the training. Table 24 shows the percentage means for each subject in the four Centers for the pretest and posttest.

Table 24
Average Percentage Means of Scores for Pretest
and Posttest for Four Centers
(Cognitive Test)

Subject	Pretest	Posttest
Biology	75.91%	83.26%
Mathematics	52.23%	63.22%
General Science	49.21%	62.74%
Physics	37.35%	58.91%
Chemistry	32.13%	58.65%

It is to be noted that while there were significant gains as shown by the t-test, Table 24 indicates that with the exception of Biology, the Centers can still look for a greater increase in the subject matter knowledge of teachers after training. Note that the percentage means of the Physics and Chemistry teachers are slightly less than 60% in the posttest. As teachers, perhaps a higher goal of performance can be set for them. This could possibly be suggested to each RSTC. This suggestion may be applied also to the Mathematics and General Science

teachers who had averages slightly above 60%. The Biology teacher participants fared much better (83.26%) but this is expected since they scored 75.91% in the pretest. The pretest means show that in the order of priority, teachers of Chemistry, Physics, General Science, and Mathematics have a definite need for further improvement. The benefit to Biology teachers, in terms of subject matter, appears peripheral.

For comparison between performances in each subject area, the t-values for each subject are tabulated and shown in Table 25. The greater the t-value, the greater the change of each group. The value per subject area for all four Centers are also included.

Table 25

Comparison of t-values for the Cognitive Test
in each Subject Area in Four Centers

Subject	St. Louis Univer- sity	Aquinas Univer- sity	Ateneo de Davao	Notre Dame of Marbel	t-value for four Centers
Physics	6.35	11.05	7.79	7.59	15.81
Chemistry	7.21	7.93	12.83	16.93	18.51
Biology	4.89	2.59	2.85	6.25	7.91
General Science	3.20	6.65	6.29	4.97	10.30
Mathematics	5.68	7.46	4.79	3.27	10.75

Inspection of Table 25 shows that the Chemistry teachers show the greatest change, followed by the Physics teachers, then by the General Science and Mathematics groups. Biology teachers exhibited the smallest change, although as stated before, these changes are still significant.

The t-values are indicative of how much improvement, in terms of subject matter, the various Centers were able to impart to the participants.

2. Residual Gains

The residual gain (RG) is a measure of how much has been learned that is unrelated ($r = 0$) to initial performance. A large positive value of RG would indicate superior RSTC training. Performance among Centers was compared using this method.

Residual gain is defined as the difference between a predicted score ($Y' = a + bX$) and the actual posttest score (Y),

or

$$\begin{aligned}\text{Residual Gain} &= Y' - Y \\ &= a + bX - y\end{aligned}$$

where

- Y' = predicted posttest score
- a = Y intercept of the regression line
- b = slope of the regression line
- X = actual pretest score
- Y = actual posttest score

A single linear regression equation is generated for each subject using the results of the pretest and the posttest of all the teachers in the four Centers. The linear regression equations are shown in Table 26.

Table 26

Linear Regression Equations of Posttest Scores (Y')
and Pretest Scores (X)

Subject	Linear Regression Equations
Physics	$Y' = 25.34 + 0.45 (X)$
Chemistry	$Y' = 22.90 + 0.40 (X)$
Biology	$Y' = 31.68 + 0.27 (X)$
General Science	$Y' = 21.26 + 0.37 (X)$
Mathematics	$Y' = 13.35 + 0.34 (X)$

Positive as well as negative mean residual gains were registered in all subjects. Table 27 shows that prominent positive gains were recorded in the following areas: Physics at Aquinas University; Chemistry at Notre Dame of Marbel College and Ateneo de Davao; Biology at Notre Dame of Marbel College; and General Science at Aquinas University.

Table 27
Mean Residual Gains

Subject		St. Louis University	Aquinas University	Ateneo de Davao	Notre Dame of Marbel
Physics	Mean RG	0.4153	3.1361	-0.8551	-2.8246
	n	24	25	24	24
Chemistry	Mean RG	-6.1646	0.0669	2.2502	3.6133
	n	23	20	24	24
Biology	Mean RG	-0.2588	-0.1019	-1.8583	2.2326
	n	23	25	22	22
General Science	Mean RG	-0.7527	1.0532	-0.0188	-0.3603
	n	18	21	24	23
Mathematics	Mean RG	0.8717	0.7591	-1.2913	-0.7187
	n	22	25	20	23

3. Standard Error of Difference of Scores (s.e.d.)

The reliability (r_{tt}) of each achievement test was computed using the Kuder-Richardson Formula 20. The results for each subject are shown in Table 28.

Table 28
Reliability (r_{tt}), Standard Error of Measurement (s.e.m.), and Standard Error of Difference (s.e.d.)

	Physics		Chemistry		Biology		General Science		Mathematics	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
r_{tt}^*	0.7099	0.8254	0.5025	0.70	0.8445	0.8589	0.7586	0.7386	0.7140	0.7054
s.e.m.	3.5225	3.6478	3.2093	2.95	3.1626	2.1712	3.0855	3.9317	3.6580	2.1331
s.e.d.	5.0710		4.36		3.8362		4.9979		4.2345	
1.96 x (s.e.d.)	9.93		8.54		7.52		7.84		8.29	

*Using Kuder-Richardson Formula 20.

The standard error of difference of scores (s.e.d.) was computed using the values of r_{tt} . The s.e.d. is the basis for determining whether the change in score of each teacher is significant. The values of the s.e.d. for each subject are also found in Table 28.

Computation of Standard Error of Difference of Score (s.e.d.) and Standard Error of Measurement (s.e.m.)

If it is desired to determine whether the gain of an individual from pretest to posttest is significant, the standard error of difference of score (s.e.d.) may be used. The s.e.d. is computed from the equation

$$s.e.d. = \sqrt{(s.e.m_x)^2 + (s.e.m_y)^2}$$

where

$s.e.m_x$ is the standard error of measurement of the pretest

and

$s.e.m_y$ is the standard error of measurement of the posttest.

To compute for s.e.m. of either test, the formula

$$s.e.m. = (s.d.) \sqrt{1 - r_{tt}}$$

is used where s.d. is the standard deviation of the test and r_{tt} is the reliability of the same test.

Having computed for the s.e.d. of the pretest and posttest, the gain in score of an individual can be gauged as significant or not. For instance, it can be claimed that when the gain (posttest score minus pretest score) of an individual is equal or greater than $1.96 \times (s.e.d.)$, then that individual exhibited true gain in knowledge with only 5% possibility of being in error. The number 1.96 is a factor that determines the probability of error in the statistical conclusion. The use of s.e.d. therefore enables us to tell whether the gain of each teacher is a true gain or whether the gain may have occurred only by chance. Simply reporting the gains of each teacher is not really meaningful because such gains will inevitably occur (even without training) from pretest to posttest due to certain factors such as test wiseness, history, and the fact that having taken the pretest has a facilitating or practice effect on the posttest. What is established by the use of the s.e.d. is the statistical significance of the individual gains.

The entries in the third column of Tables 29, 30, 31, 32 and 33 indicate the total number of teachers in each Center, per subject, whose difference in scores from the pretest to the posttest were greater than 1.96 multiplied by s.e.d. The value $1.96 \times (\text{s.e.d.})$ represents the critical or minimum change in score of a teacher in order to be considered significant with 95% confidence. This means that, to be 95% sure that the scores in the posttest and the scores in the pretest of an individual teacher represents a true difference in his scores, it should be equal to or greater than $1.96 \times (\text{s.e.d.})$.

The last column shows the percentage of teachers with gains greater than $1.96 \times (\text{s.e.d.})$. The tables also show a comparison of the number of teachers in each Center with significant gain in scores in each discipline.

Table 29
Percent of Physics Teacher with Differences $\geq 1.96 \times (\text{s.e.d.})$

RSTC	Number of teachers	No. of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$	% of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$
St. Louis University	24	13	54.00
Aquinas University	27	21	78.00
Ateneo de Davao	24	15	62.50
Notre Dame of Marbel	24	10	42.00
Total for Four Centers	99	59	59.60

Table 30

Percent of Chemistry Teachers with Differences
 $\geq 1.96 \times (\text{s.e.d.})$

RSTC	Number of Teachers	No. of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$	% of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$
St. Louis University	25	8	32.00
Aquinas University	20	15	75.00
Ateneo de Davao	24	21	88.00
Notre Dame of Marbel College	24	23	96.00
Total for Four Centers	93	67	72.04

Table 31

Percent of Biology Teachers with Differences
 $\geq 1.96 \times (\text{s.e.d.})$

RSTC	Number of Teachers	No. of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$	% of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$
St. Louis University	24	6	25.00
Aquinas University	26	1	3.85
Ateneo de Davao	23	2	8.70
Notre Dame of Marbel College	22	9	41.00
Total for Four Centers	95	18	18.95

Table 32

Percent of General Science Teachers with Differences
 $\geq 1.96 \times (\text{s.e.d.})$

RSTC	Number of Teachers	No. of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$	% of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$
St. Louis University	20	9	45.00
Aquinas University	24	11	46.00
Ateneo de Davao	26	10	38.00
Notre Dame of Marbel College	25	11	44.00
Total for Four Centers	95	41	43.16

Table 33

Percent of Mathematics Teachers with Differences
 $\geq 1.96 \times (\text{s.e.d.})$

RSTC	Number of teachers	No. of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$	% of teachers with differences $\geq 1.96 \times (\text{s.e.d.})$
St. Louis University	23	3	13.00
Aquinas University	27	3	11.00
Ateneo de Davao	23	0	00.00
Notre Dame of Marbel College	25	2	8.00
Total for Four Centers	98	8	8.16

Discussion of Results

In Physics, the Aquinas University participants had the largest percentage (78%) of teachers with significant gain in scores, followed by Ateneo de Davao (62.5%), then St. Louis University (54%), and Notre Dame of Marbel College (42%). About fifty nine percent (59.60%) of all the Physics participants exhibited true difference in ability from pretest to posttest.

Most of the Chemistry teacher participants had significant gain in scores from pretest to posttest. Ninety six percent (96%) of the Chemistry participants from Notre Dame of Marbel College exhibited true difference in ability from pretest to posttest. It was followed by the Chemistry participants of Ateneo de Davao with 88% of them with significant gain in scores. The Chemistry participants of Aquinas University followed with 75% of them with significant gain in scores. It must be noted that only the St. Louis University participants had a rather low percentage with only 32% gain in score. One possible explanation for this is the fact that the participants of the so-called Chemistry "Crash" program (trainees take Chemistry for six weeks only) were combined with the participants of the Sequential scheme (trainees take Chemistry for two summers, a total of 12 weeks) who were in the second summer of their training. As a consequence, the instructors may have found it difficult to adjust their daily activities to the two different groups.

For Biology, nothing much can be expected because of the ceiling effect of the pretest. Notre Dame of Marbel College and St. Louis University were the only ones who got a high percentage of teachers with significant change of score from pretest to posttest, 41% and 25% respectively. Ateneo de Davao got 8.7% and Aquinas University, only 3.85%.

In General Science, the percentages of the number of teachers with significant gain in scores were not too far from one another (38% to 46%); 46% for Aquinas University, 45% for St. Louis University, 44% for Notre Dame of Marbel College and 38% for Ateneo de Davao. The overall percentage for the four Centers is 43.16% which is rather low. This low overall percentage may be due to the fact that the five Centers were not uniform in the course offerings in General Science. St. Louis University and Ateneo de Davao followed the Integrated Science book all throughout the summer institute, while Aquinas University and Silliman University took up Earth Science in the first half of the institute and Integrated Science in the last half. Notre Dame of Marbel had Earth Science for the whole summer institute.

The Mathematics participants had a very low percentage of teachers with significant change in scores, only 8.16% for all four Centers. St. Louis University had 13%, Aquinas University 11%, Notre Dame of Marbel 8% and Ateneo de Davao had zero percent.

An examination of the different syllabi submitted by the RSTC Mathematics instructors showed that most of them did not attempt to cover all the topics usually found in a Geometry textbook. The courses were more on the processes needed in Geometry such as reasoning rather than on content per se. There was one Center which conducted the Mathematics course on algebraic functions instead of Geometry. This may explain the low percentage of teachers with significant changes in scores in Mathematics.

4. Multiple Regression of Test Scores
With Teacher Personal Data

The scores in both pretest and posttest were correlated with the following teacher personal data: age, sex, major, minor, kind of school (public or private), years of teaching the subject, previous use of UPSEC materials and number of students per class. Multiple regression was done separately for every subject in each Center and the results are given in Tables 17 to 56 of Progress Report No. 2.

Multiple regression for the posttests were also performed for each subject with all the teachers in the four Centers combined. This was done to find out, in general, what variables are good predictors for a given subject. The multiple regression tables are not presented but what follows are the important results of the combined multiple regression for each subject.

Table 34 shows the important variables for consideration in the selection of teachers in each subject.

Table 34

Variables that are Able to Predict Achievement
in the Posttest for all Subjects: Listed
in Decreasing Importance

Subject	Variables
Physics	Minor, Major, Kind of School (in favor of Private)
Chemistry	Major, Sex (in favor of Females), Kind of school (in favor of Public), Previous use of UPSEC materials
Biology	Previous use of UPSEC materials, Minor, Sex (in favor of Males)
General Science	Years of teaching General Science, Previous use of UPSEC materials
Mathematics	Years of teaching Mathematics, Major, Sex (in favor of Females) Previous use of UPSEC materials

The important consideration in the in-service training of science teachers ought to be the variables that are able to contribute to the change among the participants during the summer training. These variables are those that appeared important in the prediction of posttest scores. Hence for each subject it is suggested that the variables listed in Table 34 be considered in the selection of applicants for each subject.

c. Retention of Teacher Participants.

One of the aims of the evaluation project was to assess the summer science institutes and the role they play in the improvement of the science education program of the country. Aside from identifying the variables related to the intended outcomes of the in-service training program (which was done extensively with the data on the 1975 participants and their classes), an attempt was also made to find out whether the past teacher trainees of the RSTCs returned to their schools and implemented what they learned.

A questionnaire (Form B-1) was sent to the RSTC participants from 1971 to 1974. Of the total 851 questionnaires sent, 444 were returned which means a fairly good return of 54%. Table 35 summarizes the percentage of the returns received.

Table 35
Percentage of Respondents of 1971 to 1974 Teacher
Participants (By Year and Subject)

Year	Subject	Number of Returns	Number of Trainees	Percentage of Returns
1971	Physics	65	127	51%
1971	Chemistry	55	123	45%
1972	Biology	47	101	47%
1972	Gen. Science	58	101	57%
1972	Mathematics	68	128	53%
1974	Physics	75	119	63%
1974	Chemistry	76	122	64%
Total		444	851	54%

The main purpose of the questionnaire was to find out to what degree the teacher trainees implemented what they learned in the SSI. Before this, however, they were first asked whether they were still with the same school which sent them to the PSTC training, or if not, their reasons for not returning. The results of the responses to this question show the following percentage of teachers still connected with their school:

Table 36
Percent Retention of Participants
by Schools

Respondents	Percentage of Teachers Still with their Schools
1971 Physics participants	71%
1971 Chemistry participants	64%
1972 Biology participants	79%
1972 General Science participants	78%
1972 Mathematics participants	78%
1974 Physics participants	81%
1974 Chemistry participants	84%

It can be seen that the rate of retention of teachers is higher for the more recent trainees. Among the reasons given by those who have left or transferred were the following:

	<u>Percentage of Respondents</u>
(1) higher salary elsewhere	9%
(2) greater opportunities for advancement in the new job	7%
(3) transfer of residence	6%
(4) personal/family reasons	5%
(5) more attractive fringe benefits in other schools	5%
(6) a more challenging job elsewhere	4%
(7) personal conflict with superiors	3%
(8) a more prestigious job elsewhere	2%
(9) misunderstanding with peers	1%
(10) security in the new job	1%
(11) promoted in rank	1%
(12) studying	1%

Monetary, job advancement considerations and personal reasons play important roles for those who transferred to other schools or found other jobs.

The 1971-1974 participants were then asked the subjects they taught after their training. Table 37 shows the percentage of teachers who taught the same subject they were trained in the school year(s) following the summer institute they attended.

Table 37

Percentage of Teachers Who Taught the
Subject They Trained In

Year	Subject	School Year			
		1971- 1972	1972- 1973	1973- 1974	1974- 1975
1971	Physics	98%	95%	82%	63%
1971	Chemistry	84%	87%	87%	78%
1972	Biology		94%	83%	79%
1972	Gen. Science		91%	66%	59%
1972	Mathematics		93%	84%	66%
1974	Physics				100%
1974	Chemistry				96%

Table 37 shows that generally, a very high percentage of participants teach the subject they trained in right after the in-service program, with the 1974 Physics group registering 100%. This, then, progressively decreases with time, most marked of which was General Science which dropped from 91% to 66% after one year of implementation. The reasons for these can be gleaned from Table 38.

Table 38
Frequency Count of Reasons for not Teaching
Subject Trained in

Reason	1971			1972		1974	
	Phy- sics	Chem- istry	Bio- logy	General Science	Mathe- matics	Phy- sics	Chem- istry
a. Change in curriculum	1	4	1	7	1	1	2
b. Greater demand for teachers in other subjects	2	-	3	7	7	1	1
c. Too many teachers trained in that subject	1	1	1	2	1	-	-
d. Others:							
Transferred to another school	1	-	3	1	3	4	1
Doing administrative work	5	4	-	-	2	-	-
Personal reasons	2	-	-	-	-	-	-
On study grant/vacation	1	-	1	-	5	1	1
Not teaching/found a new job	1	5	1	1	2	1	2
Promoted	-	-	4	-	-	3	1
Lack of equipment	-	-	-	1	-	-	-
Lack of cooperation from administrator	-	-	-	-	1	-	-
To give chance to new trainees	-	-	-	-	-	-	1

The tabulation reveals that the most common reasons why teachers were not made to teach the subjects they trained in are: (1) the greater demand for teachers in other subjects, (2) changes in the curriculum, (3) their transfer to another school or another job, (4) they are doing administrative work (usually a consequence of

promotion), and (5) they are enjoying study grants.

For those teachers who returned to their schools and assumed the roles which they were trained for, the study shows the following:

- (1) Majority of the teachers (70%) still use the UPSEC book as their text.
- (2) Most of the teachers (82%) feel that their high school administrator has been moderately helpful to very helpful in implementing their in-service training.
- (3) About one-half of the respondents (52%) are able to implement in their classes approximately 80% of what they learned in the summer institute.
- (4) The incentives received by some of the participants upon their return include: raise in salary, reduced teaching load and promotion in rank.
- (5) Aside from their teaching duties, the participants performed other functions, the most common of which were: (a) participated in seminars, workshops and demonstration lessons, (b) attended conferences on science/mathematics teaching, (c) devised or produced equipment, and (d) conducted echo seminars, workshops and demonstration classes.

d. Teacher Perception of their Training.

A Science Training Inventory (Form A-5) was administered to the 1975 teacher participants nine months after attending their training. The questionnaire contains

statements about the content, methodology and philosophy of the curriculum materials and the long term effects of the training on them as teachers. A total of 470 participants responded to this questionnaire.

The participants may agree or disagree with each statement. Their degree of agreement or disagreement with a statement is based on a 7-point scale; 7 if they strongly agree and 1 if they strongly disagree. If their feeling is between the two extremes, the respondents have a choice among the remaining numbers 2 to 6.

Some of the statements are positively stated. Answers to the positive statements are recorded as they are. Answers to the negative statements are subtracted from 8 to change them to positive. For example, consider the statement: "The training did not make me a better teacher." One who strongly disagrees with the statement and answers the number 1 felt that the training made him a better teacher, therefore this would be equal to strongly agree ($8-1 = 7$) if the statement was stated positively.

This technique of making some statements positive and some negative is designed to detect consistency on the part of the respondents and also to break the monotony of having to react to all positive statements. In general, such device is designed to increase the validity and reliability of the instrument.

Discussion of Results

Table 39 summarizes the results of the responses to the first ten items in the Science Training Inventory.

Table 39

Summary of the Ratings Given by SSI Participants
to the Science Training Inventory

Item Number	Mean and Standard Deviation by Subject										Weighted Mean
	Physics n = 97		Chemistry n = 80		Biology n = 111		Gen. Science n = 95		Mathematics n = 87		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
1	6.51	1.08	6.48	1.37	6.00	1.67	6.02	1.89	6.42	1.21	6.28
2	6.23	1.46	6.44	1.11	5.92	1.46	6.31	1.17	6.11	1.20	6.20
3	5.34	1.38	5.45	1.29	5.03	1.56	5.35	1.40	NA*	NA*	5.29
4	2.29	1.61	2.32	1.50	1.97	1.35	2.06	1.45	NA*	NA*	2.16
5	6.33	1.18	6.56	0.94	5.83	1.61	6.28	1.34	5.80	1.52	6.16
6	2.28	1.63	1.89	1.32	2.33	1.55	2.17	1.38	2.00	1.11	2.23
7	2.15	1.67	1.86	1.26	1.80	1.56	1.96	1.50	1.70	1.32	1.90
8	5.90	1.59	6.07	1.52	6.01	1.60	5.66	1.70	NA*	NA*	5.91
9	5.75	1.14	5.99	1.29	5.80	1.34	5.84	1.32	5.76	1.24	5.79
10	2.21	1.59	2.00	1.50	2.03	1.39	1.78	1.15	1.83	1.16	1.92
All Ten Items	4.50	0.64	4.50	0.51	4.27	0.65	4.35	0.52	4.22	0.55	4.38

*Not Applicable.

An analysis of Table 39 shows that a mean of 4.38 was obtained for all the subjects, with Physics and Chemistry getting the highest rating of 4.50 and Mathematics getting the lowest rating of 4.22. Since the scale used is 1 to 7, a mean of 4 is considered average. It can therefore be concluded that the participants think that they received above average training at the summer institutes.

With regard to the individual items in the instrument, the following conclusions can be made:

- 1) The response to item 1 indicates that the RSTC participants generally agreed that the training they received made them better teachers. The average of 6.28 (out of a possible 7) supports this conclusion.
- 2) The participants felt that attendance in the summer institutes significantly improved their understanding of the subject they trained in: average rating is 6.20. This is confirmed by the posttest Achievement Test scores they obtained as compared to the pretest results.
- 3) The other aspects of the course which they think they improved in were: laboratory skills, teaching methodology, test construction and evaluation.

Results of t-tests performed on the difference between means for independent samples (see Table 40) reveal significant differences (at 0.01 level) between Physics and Mathematics in favor of Physics and between Chemistry and Mathematics in favor of Chemistry. There is significant difference (at 0.05 level) between Physics and Biology in favor of Physics and between Chemistry and Biology in favor of Chemistry. All the

other pairs reveal no significant differences. These findings may be summarized the following way: the Physics and Chemistry participants felt that they received better training at the summer institutes as compared with the trainees of the other subjects. This could probably be due to the fact that they had a greater need for further training than those of the other disciplines.

Table 40
Results of t-tests Performed on the
Differences Between Means

t-test	t-value	Decision	Level of Significance
t_{PM}	3.55	Significant	$p < .01$
t_{CM}	3.14	Significant	$p < .01$
t_{PB}	2.62	Significant	$p < .05$
t_{CB}	2.58	Significant	$p < .05$
t_{PG}	1.75	Not Significant	
t_{CG}	1.70	Not Significant	
t_{GM}	1.44	Not Significant	
t_{PC}	0.04	Not Significant	

Legend: P = Physics
C = Chemistry
B = Biology
G = General Science
M = Mathematics

t_{PM} reads : t-test on the difference between means of Physics and Mathematics

e. Ranking of Objectives.

In the summer of 1976, the teacher participants were asked to rank a set of ten science teaching objectives (Form E-2). This instrument was also administered to the 1975 SSI Instructors. For the teacher participants, Form E-2 was given as a pretest (at the start of the summer session) and as a posttest (at the end of summer). The method of ranking used for the instructors (discussed on page 19 of this report) was also applied for the participants.

The results of the ranking of the ten objectives (a to j) of the participants for Physics, Chemistry and General Science on the pretest and posttest are shown in Tables 41 and 42.

Table 41

A Summary of the Rankings Made by the Participants
of Physics, Chemistry and General Science
in the Pretest

Subjects	Objectives									
	a	b	c	d	e	f	g	h	i	j
Physics	4	2	10	1	7	6	3	5	8	9
Chemistry	4	2	10	1	8	9	6.5	6.5	3	5
General Science	7	2.5	10	1	8	2.5	4	9	6	5
Overall Ranking	4	2	10	1	9	6	3	8	5	7

Table 42

A Summary of the Rankings Made by the Participants
of Physics, Chemistry and General Science
in the Posttest

Subject	Objectives									
	a	b	c	d	e	f	g	h	i	j
Physics	6	3	10	1	8	5	2	7	4	9
Chemistry	9	2	10	1	7	3	6	8	4	5
General Science	9	6	10	1	8	2	3	5	7	4
Overall Ranking	9	3.5	10	1	8	2	3.5	7	5	6

An examination of Tables 41 and 42 reveals that there were two objectives which changed considerably from pretest to posttest. Objective "a" (ability to recall important facts, laws and theories of science) ranked 4th in the pretest and became 9th (much lower) in the posttest. Similarly, there was a change of opinion about objective "f" (to develop skills derived from laboratory manipulation of common science apparatus) which ranked 6th in the pretest and became 2nd (higher) in the posttest. These changes are considered for the better.

The decrease of rank for objective "a" might indicate that teachers place less emphasis on memorization and the mere acquisition of facts. The increase of the rank for objective "f" could mean that the teachers recognized the importance of the laboratory aspect of science. This change on the ranking of objectives could be attributed to the SSI programs.

3. RSTC Administration

a. Selection Policy.

The RSTC administrators have a more or less uniform method of selecting participants for all subjects. The RSTC disseminates information about the scholarship through

- (a) letters,
- (b) announcements in seminars, meetings and workshops,
- (c) newspapers, and
- (d) telegrams.

A screening board consisting of staff members of the RSTC select candidates to the summer institute. According to the ranking made by the respondents, the following criteria in decreasing order, were considered important:

- (a) scholastic standing,
- (b) teaching experience, and
- (c) needs of the high school.

Recommendations of the principal or supervisor, commitment to the program, attitude of the candidates, age and sex are also considered.

The RSTCs have a more or less uniform policy for distributing teacher-participants, 50% from the public and 50% from the private schools. In practice, however, this policy has not been rigidly enforced. They would rather take in more qualified participants than follow the 50-50 rule.

b. Incentives Given to Participants.

All RSTCs gave the following incentives to their teacher participants:

- (1) stipend
- (2) book allowance
- (3) equipment hand-outs
- (4) copies of the textbook and Teacher's Guide in their subject
- (5) transportation to and from the RSTC.

In addition to these, three RSTCs give free board and lodging and one RSTC provides allowance for field trips.

c. Incentives Given to RSTC Instructors.

All RSTCs have an average of two instructors per subject during the summer institute. Seventeen of the instructors for the 1975 Summer Institute were invited from other centers or colleges mainly through the recommendation of the UP Science Education Center.

The RSTCs differed in the incentives given to the instructors. The salaries given to instructors ranged from ₱900 to ₱1,500 for the Summer Institute. Three of the RSTCs provided travel expenses to the instructors invited from other schools. Two of the RSTCs provided free board and lodging and one RSTC provided free lodging.

4. Sequential and Crash Chemistry Programs

In the meeting of the Sub-committee of the Working Committee of the Science Education Project of the Philippines held on January 16, 1976, it was agreed to make a comparative study of the Sequential (two-summer) with the non-sequential or Crash (one summer) Chemistry courses. The evaluation team was requested to: (1) compare the performance of the two groups of participants in terms of increase in knowledge of content, difference in teaching methodology, knowledge of the processes of science and change in attitude towards science; and (2) compare the participants of the two programs in terms of their degrees of implementation.

Aquinas University, Ateneo de Davao and Silliman University opted for a Crash program while St. Louis University and Notre Dame of Marbel College agreed to offer the Sequential course for Chemistry. In the Summer of 1976, Silliman University shifted to an Integrated Physics and Chemistry course and no longer fitted into the agreed evaluation plan of comparing the Sequential and Crash programs. However, information on the Chemistry, Physics and Integrated Science I participants of Summer 1976 in Silliman University was also gathered since the evaluation team failed to give pretests to the 1975 participants of Silliman.

The evaluation of the Sequential and Crash programs started on April 1, 1976. Information was gathered from a total of 106 teacher participants in Chemistry from all four Centers distributed as follows:

- (1) Sequential Chemistry; 54 participants (28 from St. Louis University and 26 from Notre Dame of Marbel)

- (2) Crash Program; 52 participants (25 from Aquinas University and 27 from Ateneo de Davao)

Summer of 1976

The following instruments were administered:

- (1) Scientific Attitude and Science Teaching Inventory (Form A-1)

It was administered during the first week of summer as a pretest and during the last week as a posttest in all four Centers.

- (2) Cognitive Test - Chemistry Topics (Form A-2)

Administered as a pretest in all four Centers at the start of Summer, 1976. It was again administered as a posttest in Aquinas University and Ateneo de Davao (both Crash Programs) during the last week of summer. For the Sequential groups, however, the test was divided into two parts. Items 1 to 26 consist the first part (up to the topic taken up during the first summer of the sequential) and items 27 to 50 consist the second part. This second part was intended to be administered at the end of Summer 1977 or after the second summer of the Sequential group. Only the first part of the test was given to the St. Louis University and Notre Dame of Marbel College participants as posttest during the last week of Summer 1976. Results of the test were to be consolidated with the second part of Summer 1977 results.

- (3) Teacher Personal Data (Form A-4)

Administered during the first week of summer to all four groups.

(4) Science Training Inventory (Form A-5)

Administered during the last week of Summer 1976 as a pretest and in the middle of August, 1976 (during the school year) as a posttest to all four groups.

(5) Degree of Implementation (Form A-7)

Administered during the middle of August, 1976 to experimental teachers chosen from all four Centers (10 from each RSTC). This was administered as a posttest to the Sequential groups during the last week of Summer 1977. The evaluation team decided to give it also to the participants of the Crash program during the start of the school year 1977-1978, or one year after the trainees' course.

(6) Attitude Towards Teaching (Form A-8.2)

Administered to the participants of all four Centers during the last week of Summer, 1976 as a pretest and in the middle of August, 1976 as a posttest. There are three factors in this questionnaire, namely: (a) teaching as a career, (b) science as a subject and (c) the relationship between the teacher and the administrator.

For St. Louis University, there was a significant difference in the pretest and the posttest means in the factor "attitude towards teaching as a career" in favor of the posttest. For Notre Dame of Marbel, there was a significant change in their attitude towards science as a subject (the second factor) in favor of the pretest scores. This seems to indicate that either regression took place or the participants' perception of science

as a subject became more confused after the training program. Taking all the participants as a group, there were significant changes in their attitude towards teaching as a career and relationship with administrators. For the third factor (relationship with administrator), however, the pretest mean is higher than the posttest mean. Based on the questions asked for the third factor, this seems to indicate that the teachers became more aware of the problems that they would encounter upon implementation of what they learned in the institute.

(7) Ranking of Objectives (Form B-2)

Administered during the last week of Summer 1976 to participants of all four Centers. Participants in Chemistry were asked to rank ten objectives of their course according to the importance they attach to each objective.

Results show that for each subject, the teacher trainees generally agreed among themselves in their ranking of objectives. Their overall rankings were also in significant agreement with the rankings made by the instructors of the course.

(8) Learning Environment Scale (Form F-5)

This was administered to the Chemistry students of 40 teachers chosen among the participants (10 teachers per Center). This was given during the first week of August, 1976 as a pretest and administered again in the middle of February, 1977 as a posttest.

Summer of 1977

The evaluation team assumed that all the participants of the Sequential Chemistry would return for the second summer of 1977. No pretests were given at the start of Summer 1977 since all the pretests were already administered during the summer of 1976. The evaluation team went to the RSTCs which offered the Sequential Chemistry programs to administer the posttests during the later part of Summer 1977.

In St. Louis University, the evaluation team found out that 11 out of 30 original participants did not return and that their slots were filled by St. Louis University Foundation Scholars. The coverage of the course was also vastly changed from what was expected by the evaluation team. Instead of continuing the topics in Chemistry that were not covered during the Summer of 1976, the instructors offered the Integrated Physics and Chemistry course. Four (4) weeks were devoted to Physics and only two (2) weeks were devoted to Chemistry. The posttest was still administered in spite of its now highly questionable validity due to the change of topics covered in Summer of 1977.

In Notre Dame of Marbel College, 13 out of 30 original participants did not return. Their slots were filled by new participants. For the benefit of the new participants, the instructor gave a review of the topics taken during the Summer of 1976. This resulted in a limited coverage of the subject matter originally intended to be taken up during the Summer of 1977. In spite of this, the posttest was still administered to the participants. However, the results cannot be interpreted because of its doubtful validity.

The other instrument administered to the participants of the Sequential Chemistry program during the Summer of 1977 was Form A-9.2 which is a survey of the participants' opinion regarding the sequential scheme. In Notre Dame of Marbel College, 100% of the participants preferred the Sequential Chemistry while in St. Louis University, 89% of the participants favored the sequential scheme with the 11% remaining neutral regarding the matter. The instructors themselves, when interviewed, felt that one summer training in Chemistry is inadequate.

A questionnaire was also administered to the Chemistry Crash program participants whether six (6) weeks or one summer was sufficient for their needs. In Aquinas University, 92% (22 out of 24) of the respondents answered No while in Ateneo de Davao, 84% (21 out of 25) answered similarly. These same respondents recommended two (2) sequential summers for the course.

The evaluation team also tried to find out the reasons for some of the original participants not returning for the second summer. A questionnaire (Form A-10) was sent to the twenty-four (24) non-returnees. Of the twenty-four (24) teachers, only seven (7) responded. The reasons given for not returning are as follows:

- (1) Three (3) had taken the second part of the course as participants during the Summer of 1975.
- (2) Three (3) were assigned to teach another subject after the training.
- (3) Three (3) felt that one summer of training is adequate for the course.
- (4) Three (3) had personal reasons for not returning (sick, on the family way).

- (5) One (1) trainee said that his request for funds was not granted by the school administrator and he was not able to implement what he learned.
- (6) One (1) participant was promoted to acting administrator.

With the drastic changes in the setting and conditions for the second summer, the evaluation team could no longer give meaningful conclusions or recommendations from the data gathered. The comparison of the Crash and the Sequential course was premised on the assumption that teachers for the Sequential program would all return for a second summer and that they would be exposed to the second part of the Chemistry course. For reasons of their own, St. Louis University shifted to the Integrated Chemistry and Physics course. In Notre Dame of Marbel College, the presence of newcomers altered the coverage of the course. These changes were totally unexpected by the evaluation team. These changes invalidated any attempt of comparing the two groups.

The data for the Crash program teachers (Aquinas University and Ateneo de Davao) were incorporated with the data of Chemistry teachers who attended the Summer 1975 program, thus increasing the number of cases with a corresponding increase in reliability.

The evaluation team had all the instruments and strategy for comparing the two groups but with the alteration of the treatment and experimental setting, the comparative study was totally negated.

High School Setting

1. Mental Vocabulary Ability Tests

The Mental Vocabulary Ability Tests (Form F-4) were developed to measure the mental ability of the high school students used in the study. The scores of students in Mental Vocabulary Ability tests were correlated with their achievement test scores and were intended to serve as a possible covariate in the comparison of the Achievement Tests of the Experimental and Control classes in this evaluation study. Two forms were constructed: Form A for first and second year students and Form B for third and fourth year students.

The validity and reliability of these tests are assumed because the items were carefully chosen from standardized tests available. The items were selected based on the knowledge that, on the average, Filipino elementary and high school students are approximately two years behind their American counterparts in reading ability. Words more commonly used than others were selected as well as items of common experience such as days of the week, time of day, units of measure.

The items selected were given to several high school teachers for comments and suggestions. Then the tests were administered to selected high school students (representative of the samples for which the instruments will be used). They were also asked to comment on the items and to write down words, phrases and sentences that they find hard to understand. The final versions were then printed for administration to the intended respondents.

Tables 43 and 44 summarize the results obtained from a total of 251 classes (around 12,000 students).

Table 43

Mean and Standard Deviation of the
Mental and Vocabulary
Ability Test

Year Level	Experimental		Control		Experimental and Control	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
First Year	18.94 n=22	3.71	18.09 n=22	4.80	18.51 n=44	4.26
Second Year	21.73 n=26	4.50	20.72 n=23	4.84	21.25 n=49	4.65
Third Year	25.10 n=50	4.12	21.98 n=49	4.98	23.56 n=99	4.80
Fourth Year	27.12 n=26	4.74	24.59 n=33	4.74	25.71 n=59	4.87

Table 44

t-test of the Significance of Difference
Between Means

Classes	t-value	Decision
1st year (Experimental vs. Control)	0.7025	Not Significant
2nd year (Experimental vs. Control)	0.7600	Not Significant
3rd year (Experimental vs. Control)	3.4200	$p < 0.01$
4th year (Experimental vs. Control)	2.0240	$p < 0.05$
1st year vs. 2nd year	2.9800	$p < 0.01$
3rd year vs. 4th year	2.7600	$p < 0.01$

There is a significant difference at the 0.01 level between the means of the freshmen and sophomore high school students. This indicates that Form A of the test is able to discriminate between first and second year high school students, with the latter getting the higher scores. The same can be said of Form B administered to the junior and senior high school students.

There is no significant difference in the means of the Experimental and Control groups among the freshmen and sophomore students. If the test is an indicator of mental ability, then this result implies that mental ability is not a biasing factor among first and second year high school students included in the study.

On the other hand, mental ability as measured by Form B is a biasing factor between the Experimental and Control group in both the third and fourth year high school students. This result necessitated the use of the Mental Vocabulary Ability Test scores as a covariate in analyzing the achievements of the third and fourth year students.

The correlations of the Mental Vocabulary Ability tests scores with the achievement test scores for each subject are shown in Table 45. With the exception of Mathematics, the Mental Vocabulary Ability test scores are found to be significantly correlated with the student performance as measured by the Achievement Tests administered to them during the school year. This an indication that the instruments possess high validity for predicting student achievement in Physics, Chemistry, Biology and General Science. The predicting ability of the Mental Vocabulary Ability Test is further enhanced with the use of the Learning Environment Scale which is discussed on page 130 of this report.

Table 45

Correlation of Mental Vocabulary Ability Test
Scores with Achievement Test Score

Physics	Chemistry	Biology	General Science	Mathematics
n = 30	n = 35	n = 38	n = 38	n = 31
0.55**	0.47**	0.61**	0.41**	0.29

**Significant, $p \leq 0.01$

2. Student Attitudes and Interest

To determine any significant changes in the attitude of students before and after undergoing a science course, two instruments were developed and administered to both the Experimental and Control classes (see Forms F-1 and F-7).

a. Science Attitude and Interest Inventory (Form F-1).

This contained a list of statements about science and scientists to which students react on a five point scale. It was administered to the Experimental and Control classes as a pretest at the beginning of academic year 1975-1976 and again as a posttest in February, 1976. The sample consists of a total of 234 classes in all year levels (1st to 4th year). For each class only a randomly selected half of the total number of students were asked to respond.

Discussion of Results

There were no significant changes in the pretest and posttest means for both the Control and Experimental groups.

Comparing the posttest means of the Experimental and Control groups, a significant difference in attitude was noted only for the Physics group in favor of the Experimental group (see Table 46).

Table 46

Mean, S.D. and t-values of Experimental and Control Classes

Subject	Experimental			Control			t-value	p
	n	Mean	S.D.	n	Mean	S.D.		
Physics	21	83.99	5.06	18	80.65	5.80	1.86	0.10
Chemistry	22	83.43	5.53	14	80.85	6.69	1.24	N.S.
Biology	20	79.83	6.42	20	77.23	5.45	1.38	N.S.
General Science	21	77.09	6.55	15	77.50	4.85	-0.20	N.S.
Mathematics	16	81.74	5.69	19	79.93	7.16	0.01	N.S.

b. Interest in Science Scale (Form F-7).

This is a list of statements related to science or mathematics activities. Students were asked to describe any significant change in their feeling toward the activity. It was administered to both Experimental and Control classes towards the end of school year 1975-1976.

Discussion of Results

The students' scores for Items 1 to 15 were used as one of the covariates in the analysis of covariance contrasting student performance of the Experimental and Control groups. It was found that on the average student scores correlated relatively high with student achievement (0.32) and low with mental ability (0.23) which make it a potential predictor of student achievement.

Items 16 to 21 were analyzed separately. The items were grouped into two: the first group consists of

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The combined students in the Experimental and Control groups for all subjects (Physics, Chemistry, Biology, General Science and Mathematics) expressed significant improvement in attitude towards science in all three items (16, 17 and 18). Table 47 shows a t-test of the means (against 2, undecided) in each of the three items in each subject.

Table 47

Mean, S.D. and t-test of the Mean of Items 16, 17, 18, 19, 20, and 21
for the Combined Experimental and Control Groups

	Attitude Item No. 16			Appreciation Item No. 17			Importance Item No. 18			Interesting Item No. 19			Easy Item No. 20			Valuable Item No. 21		
	Mean	S.D.	t-test	Mean	S.D.	t-test	Mean	S.D.	t-test	Mean	S.D.	t-test	Mean	S.D.	t-test	Mean	S.D.	t-test
Physics n = 41	2.64	0.22	18.63*	2.59	0.25	15.11*	2.60	0.24	16.01*	3.13	0.22	3.78*	2.36	0.26	-3.45*	3.28	0.33	5.43*
Chemistry n = 39	2.62	0.21	18.44*	2.57	0.20	17.80*	2.56	0.24	14.57*	3.18	0.19	5.92*	2.34	0.22	-4.54*	3.36	0.24	9.37*
Biology n = 43	2.55	0.20	18.03*	2.44	0.19	15.19*	2.58	0.10	21.13*	3.23	0.26	5.80*	2.44	0.26	1.51 ^a	3.32	0.23	7.47*
General Science n = 38	2.59	0.21	17.32*	2.45	0.24	11.56*	2.54	0.24	13.87*	3.24	0.21	7.05*	2.53	0.39	0.47 ^a	3.19	0.33	3.55*
Mathematics n = 37	2.52	0.27	11.71*	2.53	0.25	15.21*	2.55	0.21	15.93*	3.11	0.21	3.19*	2.28	0.26	-5.15*	3.23	0.38	3.60*

*Significant at the 0.01 level

94 a - Not significant

It can be seen that the means are significantly different from 2 (undecided). This could be generalized to mean that they have more positive attitude toward science at the end of the schoolyear compared to that at the beginning. The study did not include an analysis of the possible causes of this change.

Table 47 also shows the means for items 19, 20 and 21 and the t-test (against 3). Both groups of students in all subjects judged science/mathematics as interesting and valuable. The students of Biology and General Science, however, are undecided as to whether science is difficult or easy whereas the students of Chemistry, Physics and Mathematics feel that the science/mathematics courses they are taking are difficult.

The resulting scores in the three items (16, 17 and 18) of the Experimental groups were compared to the corresponding Control groups. This is shown in Table 48.

Table 48

Mean, S.D. and t-test Between Means of Experimental
and Control in Items 16, 17 and 18

		Item No. 16				Item No. 17				Item No. 18			
		n	Mean	S.D.	t-test	n	Mean	S.D.	t-test	n	Mean	S.D.	t-test
Physics	Experimental	23	2.71	0.21	2.56*	23	2.67	0.24	2.20**	23	2.67	0.21	2.26**
	Control	18	2.54	0.21		18	2.50	0.25		18	2.51	0.24	
Chemistry	Experimental	22	2.68	0.21	2.02**	22	2.60	0.21	1.13	22	2.60	0.25	1.25
	Control	20	2.55	0.18		20	2.53	0.18		20	2.51	0.20	
Biology	Experimental	23	2.55	0.16	0.00	23	2.52	0.18	1.58	23	2.57	0.18	-1.00
	Control	20	2.55	0.24		20	2.43	0.20		20	2.60	0.15	
General Science	Experimental	21	2.59	0.20	0.14	21	2.46	0.24	0.12	21	2.56	0.26	0.62
	Control	17	2.58	0.22		17	2.45	0.26		17	2.51	0.22	
Mathematics	Experimental	17	2.50	0.29	-0.32	17	2.56	0.21	0.83	17	2.56	0.22	0.42
	Control	19	2.53	0.27		19	2.49	0.29		19	2.53	0.21	

c. This comparison revealed the following results:

1. The improvement of attitude of the Experimental group toward science is significantly higher than that of the Control group for Physics and Chemistry. No significant differences were found for the other subjects (Biology, General Science and Mathematics).
2. It is only in Physics where the improvement of appreciation for the role that science plays in their daily lives had a significant difference between the Experimental and Control groups in favor of the Experimental group.
2. Again, it is only in Physics where the Experimental group differs significantly from the Control group in the degree of importance they attach to science in community and national development. No significant differences were found for the other subjects.

A comparison of the Experimental and Control classes' responses for items 19, 20, and 21 is shown in Table 49.

Table 49

Mean, S.D. and t-test Between Means of Experimental
and Control in Items 19, 20 and 21

		Item No. 19				Item No. 20				Item No. 21			
		n	Mean	S.D.	t-test	n	Mean	S.D.	t-test	n	Mean	S.D.	t-test
Physics	Experimental	23	3.19	0.24	2.12*	23	2.39	0.29	0.86	23	3.36	0.33	1.69**
	Control	18	3.05	0.16		18	2.32	0.21		18	3.19	0.30	
Chemistry	Experimental	22	3.19	0.19	0.84	22	2.31	0.25	-0.88	22	3.38	0.24	0.13
	Control	20	3.13	0.26		20	2.37	0.17		20	3.37	0.24	
Biology	Experimental	23	3.23	0.24	0.13	23	2.41	0.23	-0.77	23	3.40	0.19	2.14*
	Control	20	3.22	0.29		20	2.47	0.29		20	3.23	0.33	
General Science	Experimental	21	3.25	0.24	0.42	21	2.55	0.34	0.23	21	3.16	0.28	-0.45
	Control	17	3.22	0.18		17	2.52	0.45		17	3.21	0.39	
Mathematics	Experimental	17	3.06	0.20	-1.47	17	2.29	0.19	0.46	17	3.26	0.40	0.39
	Control	19	3.16	0.21		19	2.25	0.31		19	3.21	0.38	

Table 49 shows the following:

1. For item 19, the Physics respondents in the Experimental group have a significantly higher mean than that of the Control group. This means that in general, the students taught by the SSI trainees find the subject more interesting than their counterpart in the Control groups.
2. For item 21, the Experimental group has a significantly higher mean for Physics and Biology. This means that in general, the students taught by the SSI trainees attach more importance to these two subjects than their counterpart in the Control groups.

These two results have important implications in the way the subjects are taught by SSI participants in contrast with the non-trainees.

The total score for the first fifteen items of the Interest in Science Scale was also used in the Analysis of the Achievement Tests scores of the students. The selection of the Interest in Science Scale as a covariate was based on the observation that the total scores on the fifteen items generally correlated high with the Achievement Test and generally low with the Mental Vocabulary Ability Test scores as shown in Table 50. This makes the Interest in Science Scale a desirable covariate in addition to the Mental Vocabulary Ability Test.

Table 50

Correlation Between the Total Score for the First
Fifteen Items of the Interest in Science Scale
with (a) Achievement Test Scores and
(b) Mental Vocabulary Ability
Test Scores

n = number of classes

	Physics	Chem- istry	Biology	General Science	Mathe- matics
	n = 33	n = 37	n = 43	n = 36	n = 39
Achievement Test	0.42	0.37	0.32	0.20	0.29
Mental Vocabulary Test	0.38	0.17	0.28	0.14	0.20

3. Student Achievement

Among the measurable effects expected from the in-service training of the science teachers is better learning of their students. This could be reflected in the performance of students on achievement tests. To ascertain this effect, a comparison group (Experimental and Control) is needed to contrast the performance of students.

As originally planned, 30 Experimental and 30 Control teachers were selected per subject. For each subject, six Experimental teachers and six Control teachers were selected. The failure of some teachers to return the materials sent to them slightly reduced the number of students in the Control group. In general, though, the mortality rate may be considered reasonable as seen in Table 51.

Table 51
Number of Classes Involved
in the Evaluation Study*

	Physics	Chem- istry	Biology	General Science	Mathematics
Experimental Classes	18	21	23	19	20
Control Classes	15	16	20	20	16

*The number of class respondents indicated in the report for each instrument may vary depending on how many responses were actually sent back and on how complete the responses were for each instrument.

The possible non-equality of the quality of the two groups of teachers and their respective students made it necessary to employ statistical techniques to "equalize" them in certain characteristics. This technique is known

as analysis of covariance (ANCOVA). It combines regression with analysis of variance. This involves selecting factors (covariates) that correlate highly with student performance (the dependent variable).

In this study, seven covariates were initially selected:

- X₁ Mental ability of the students as measured by a Mental Vocabulary Ability Test (Form F-3)
- X₂ Years of teaching experience of the teacher
- X₃ Interest of the students in science as measured by the first fifteen items in the Interest in Science Scale (Form F-7)
- X₄ Educational attainment of student's father
- X₅ Educational attainment of student's mother
- X₆ Major and minor field of the teacher
- X₇ The use of UPSEC materials

In theory, a large number of covariates is not necessarily desirable. Covariates that do not function increases the value of the denominator of the F-ratio. This results in a small value of F and makes it difficult for the null hypothesis to be rejected. The ideal would be a smaller number of covariates that correlate highly with the criterion variable (achievement test) but with low correlations among themselves. This makes it necessary to compute the inter-correlation matrices of all the variables involved. The result will then serve as a guide in choosing the best combination of covariates.

Since the computer used could handle only up to a maximum of five (5) covariates, several combinations (five or less) were tried. The best results in terms of 'equalizing' groups for each subject are reported in the next pages.

Discussion of Results

- a. Biology. In biology, the best result was obtained by using X_1 , X_3 , X_7 , X_2 and X_6 as covariates (see Table 52). It is significant to note that X_4 and X_5 correlate highly with the criterion (0.48 and 0.45 respectively), but since they correlate also highly with each other, they did not function well. And since they correlate highly with X_1 , then X_1 did the job for X_4 and X_5 . Analysis of variance on the adjusted means resulted in a significant difference between the Experimental and Control groups at the 0.12 level. The difference seems minimal yet considering the difficulty of constructing measures (achievement tests, etc.) that would maximize the treatment effects, the result could be considered as satisfactory. It is to be noted that the adjusted means for the Experimental group is lower than the unadjusted means and the adjusted means for the Control is higher than that of the unadjusted means. This means that, in general, the teachers and students of the Experimental group are initially better than those from the Control groups in the factors selected. A look at the covariate means for the two groups will confirm this conclusion (see Table 53).
- b. Physics. Among the different combinations of covariates attempted, the best result was attained using only one covariate (Mental Vocabulary Ability Test Score of students). The null hypothesis of no significant difference between the means of the Experimental and Control groups was rejected at the 0.007 level (see Tables 54 and 57). This is the best level of significance among the different combinations attempted.

The next best is the combination of X_1 and X_6 ($p \leq .01$), Table 56 and followed by X_1 , X_2 , X_3 , X_6 and X_7 ($p \leq .02$) (Table 55). Again X_4 and X_5 did not play a major role.

- c. Chemistry. In Chemistry, the best combination of covariates is the same as that of Biology. The analysis of variance between the adjusted means of the Experimental and Control groups is significant at the 0.01 level (Table 59). Table 58 shows the following interesting points: (a) the science interest scale, X_3 , correlates highly (0.37) with the criterion, Y , but has a low correlation with mental ability (0.17) and the other variables. This makes X_3 a good predictor of student achievement, and (b) the same can be said of variable X_7 , the use of UPSEC materials. It correlates highly with the criterion (0.34) and correlates low with all the other variables.
- d. General Science. In General Science, only mental ability (X_1) and interest in science (X_3) appeared to function well as covariates (Table 60). They correlate highly with the criterion, 0.44 and 0.20 respectively, and they correlated low with each other (0.14). Although the achievement of the Experimental group is higher than that of the Control, the difference is not significant ($P = .18$) (Table 61). The other covariates that correlated highly with the criterion variable are: educational attainment of father (0.40), mental ability (0.29) and science interest of students (0.29).
- d. Mathematics. This is the only case where the educational attainment of the mother (X_5) played a major role as a covariate (Table 62). It has the highest correlation with the criterion (0.44). The fact that

the ANCOVA result is significant at the 0.05 level (Table 63) is an indication of a higher achievement of students taught by the RSTC teacher participants. It cannot be said that the questions are biased in favor of UPSEC materials because the use of UPSEC materials by the teachers (X_7) correlated very low with the criterion (0.09).

Summary

1. Among the different subjects under investigation, the highest level of significance obtained (lowest p) was for Physics ($p = .007$) followed by Chemistry ($p = .01$), Mathematics ($p = .05$), Biology ($p = 0.12$) and General Science ($p = 0.18$). It appears that the students in Physics and Chemistry benefited most from the in-service training of science and mathematics teachers.
2. Mental ability of the student as measured by the Mental Vocabulary Ability Test (X_1) appears as the best predictor of student achievement. This was followed by years teaching experience (X_2), and score in the Science Interest Scale (X_3). The educational attainment of the parents (X_4 and X_5) did not play significant roles because they correlated highly with each other and also with the mental ability of the students.
3. There is no case where the Control students performed better than the Experimental group. This is an indication that in-service training generally improved the teaching competence of the teacher.

Codes Used in Analysis of Covariance

- Y = Achievement scores (dependent variable) in Physics, Chemistry, Biology, General Science or Mathematics
- X₁ = Mental Vocabulary Ability Test Scores
- X₂ = Years of Teaching Experience
- X₃ = Score in Interest in Science Scale (First Fifteen items)
- X₄ = Educational Attainment of Father
- X₅ = Educational Attainment of Mother
- X₆ = Major and Minor Field of Teacher
- X₇ = Use of UPSEC Materials

Table 52

The Correlation Matrix of the Covariates and the Criterion Variable (Biology)
n = 43 classes

	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
y	1							
X ₁	0.61	1						
X ₂	0.12	-0.07	1					
X ₃	0.32	0.28	0.10	1				
X ₄	0.48	0.68	-0.17	0.19	1			
X ₅	0.45	0.65	-0.25	0.08	0.94	1		
X ₆	0.06	0.06	-0.12	0.02	0.13	0.09	1	
X ₇	0.18	0.10	0.02	0.08	0.13	0.15	0.03	1

Table 53

Differences in the Adjusted Mean Scores
in Biology Among Study Samples
According to Type of Teacher
(Experimental or Control)

Treatment Group	Experimental	Control
Number of Cases	23	20
Number of Covariates	5*	5
Unadjusted Means	25.47	22.49
Adjusted Means	25.15	22.85

Analysis of Variance

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	p
Between Groups	42.37	1	42.37	2.39	0.12
Within Groups	638.99	36	17.75		

*Covariates X_1 , X_2 , X_3 , X_6 and X_7

Table 54

The Correlation Matrix Among the Covariates
and the Criterion Variable (Physics)
n = 33 classes

	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7
Y	1							
X_1	0.48	1						
X_2	-0.05	-0.05	1					
X_3	0.42	0.38	0.16	1				
X_4	0.17	0.65	0.02	0.16	1			
X_5	-0.24	0.64	0.02	0.09	0.90	1		
X_6	-0.02	-0.09	0.16	0.22	-0.08	-0.09	1	
X_7	0.06	-0.01	0.19	0.03	-0.04	0.03	0.17	1

Table 55

Differences in the Adjusted Mean Scores
in Physics Among the Study Samples
According to Type of Teacher
(Experimental or Control)

Treatment Group	Experimental	Control
Number of Cases	18	15
Number of Covariates	5*	5
Unadjusted Means	20.70	15.59
Adjusted Means	19.87	16.60

*X₁, X₆, X₂, X₃ and X₇

Analysis of Variance

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	p
Between Groups	50.49	1	50.49	6.07	0.02
Within Groups	216.19	26	8.31		

Table 56

Differences in the Adjusted Mean Scores in Physics Among
the Study Samples According to Type of Teacher
(Experimental or Control)

Treatment Group	Experimental	Control
Number of Cases	18	15
Number of Covariates	2*	2
Unadjusted Means	20.70	15.59
Adjusted Means	19.92	16.53

Analysis of Variance

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	p
Between Groups	58.99	1	58.99	7.51	.01
Within Groups	227.87	29	7.86		

*X₁ and X₆

Table 57

Differences in the Adjusted Mean Scores in Physics
Among Study Samples According to Type of Teacher
(Experimental or Control)

Treatment Group	Experimental	Control
Number of Cases	18	25
Number of Covariates	1*	1
Unadjusted Means	20.70	15.59
Adjusted Means	19.99	16.45

Analysis of Variance

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	p
Between Groups	65.14	1	65.14	8.34	0.007
Within Groups	234.28	30	7.81		

*X₁ = Mental Vocabulary Ability Test Score

Table 58

The Correlation Matrix Among the Covariates
and the Criterion Variable (Chemistry)
n = 37 classes

	y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
y	1							
X ₁	0.31	1						
X ₂	0.34	0.07	1					
X ₃	0.37	0.17	-0.02	1				
X ₄	0.13	0.55	0.01	-0.04	1			
X ₅	0.22	0.55	0.13	-0.10	0.82	1		
X ₆	-0.01	0.18	0.37	-0.04	0.13	0.22	1	
X ₇	0.34	0.10	0.20	0.08	-0.002	0.04	-0.001	1

Table 59

Differences in the Adjusted Mean Scores in Chemistry
Among Study Samples According to Type of Teacher
(Experimental or Control)

Treatment Group	Experimental	Control
Number of Cases	21	16
Number of Covariates	5*	5
Unadjusted Means	20.31	14.07
Adjusted Means	19.56	15.06

Analysis of Variance

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	p
Between Groups	133.62	1	133.62	5.64	0.01
Within Groups	458.65	30	15.28		

*X₁, X₂, X₃, X₆, and X₇

Table 60

The Correlation Matrix Among the Covariates
and the Criterion Variable (General Science)

n = 36 classes

	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
Y	1							
X ₁	0.44	1						
X ₂	0.25	-0.09	1					
X ₃	0.20	0.14	0.25	1				
X ₄	0.30	0.50	-0.05	0.26	1			
X ₅	0.24	0.52	-0.03	0.24	0.76	1		
X ₆	-0.07	-0.20	0.29	-0.11	-0.40	-0.37	1	
X ₇	0.01	0.03	-0.06	-0.20	-0.03	-0.04	0.32	1

Table 61

Difference in the Adjusted Mean Scores in General Science
Among Study Samples According to Type of Teacher
(Experimental or Control)

Treatment Group	Experimental	Control
Number of Cases	20	16
Number of Covariates	2*	2
Unadjusted Means	20.79	18.86
Adjusted Means	20.59	18.85

Analysis of Variance

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	p
Between Groups	26.4	1	26.4	1.85	0.18
Within Groups	455.40	32	14.23		

* X_1 and X_2

Table 62

The Correlation Matrix Among the Covariates
and the Criterion Variable (Mathematics)

n = 39 classes

	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
Y	1							
X ₁	0.29	1						
X ₂	0.25	0.38	1					
X ₃	0.29	0.20	0.23	1				
X ₄	0.40	0.69	0.36	0.05	1			
X ₅	0.44	0.65	0.43	0.12	0.92	1		
X ₆	-0.07	0.04	0.21	0.06	-0.01	0.06	1	
X ₇	0.09	0.22	0.10	0.06	0.15	0.14	0.23	1

Table 63

Differences in the Adjusted Mean Scores in Mathematics
Among Study Samples According to Type of Teacher
(Experimental or Control)

Treatment Group	Experimental	Control
Number of Cases	19	20
Number of Covariates	2*	2
Unadjusted Means	22.25	22.10
Adjusted Means	18.39	18.53

Analysis of Variance

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-ratio	p
Between Groups	120.26	1	120.26	4.09	0.05
Within Groups	1028.64	35	29.39		

*X₃ and X₅

4. Experiments and Lessons

A checklist of experiments for Physics, Chemistry, Biology and General Science and lessons for Mathematics (Form F-6) was administered to students of the Experimental classes in two parts. Part I was administered in September, 1975 while Part II was given in February, 1976. The students were asked whether or not they have taken up certain lessons and experiments. This instrument was intended to cross-validate teachers' responses on the same checklist.

Since the number of student respondents was more than the number of teacher respondents for each subject, the percentage of Yes responses of the teachers and the students to each activity was computed. Then, the means of these percentages were tabulated. The mean percentage of students' Yes responses was compared with that of the teachers. The results are shown in Table 64. The test of significance was done by using the z-ratio.

Discussion of Results

It is clearly shown in Table 64 that for the four science subjects, less than 50% of the required experiments were performed in class. Since the reasons for this were not asked in the questionnaire, one can only speculate on the most probable cause(s) of this result. The most likely reason is lack of equipment, apparatus and supplies. This is a common complaint voiced by the participants themselves on several occasions. This is further strengthened by the ocular inspection made by the evaluation team that visited classes in several parts of the country. A second probable reason is the lack of time.

Formerly, Physics was taught as a double period subject or 80 minutes a day for 5 days. In contrast, the present curriculum for Physics is taught for only 60 minutes a day for 5 days making a total of only 300 minutes teaching time for one week.

The greater mean percentage of teachers' Yes responses in each of the subjects except General Science may be attributed to the fact that the checklist was given to the teachers two weeks after it was administered to the students. Furthermore the teachers may have delayed responding until the class had done the activity. The greatest difference between the mean percentage of the two groups was found in Mathematics. This may be so because activities in this subject entailed proving theorems and discussing postulates which take less time than doing experiments. Hence, in a span of two weeks the class could have taken up more than ten theorems and/or postulates. In General Science, the students' Yes responses were more than the teachers' Yes responses. This may be because the activities in the book are group-paced and not class-paced as in the other subjects. The teachers in General Science may not have been sure whether the entire class had done the activity or not.

Aside from analyzing the results for a cross-check between students' and teachers' responses, the checklists were examined as to why some experiments were done only by about 20% to 30% of the students or even less. The last five activities in all subjects except Mathematics had less than 15% Yes responses. This may be because this part of the checklist was given towards the end of the year. In Mathematics, although there were less than 50%

Yes responses to the last five activities, this proportion was relatively lower than in the earlier activities.

A further examination of the results show that some experiments which were supposed to be done in the middle of the year had very low percentages. The lowest was 14% (teachers' Yes response) for an experiment in Physics. A closer look at these experiments show that they need specific equipment and/or supplies which the school may not have. Hence the teacher may have decided to omit such activities. This ties up with the finding that the most serious problem perceived by the teachers in the implementation of the course is lack of equipment and supplies.

Table 64
Mean Percentage of Experiments Performed
By Students and Teachers
for each Subject

Subject	Number of Experiments (or Lessons)	Mean Percentage of Yes Response		z Value
		Students	Teachers	
Physics	51	40.55%	48.58%	8.24*
Chemistry	42	36.68%	43.21%	5.25*
Biology	39	41.33%	45.62%	3.97*
General Science	58	37.52%	33.84%	5.03*
Mathematics	64	45.94%	66.06%	25.97*

*Significant at .01 level where $\alpha_{.01} = 2.58$

5. Degree of Implementation

In November 1975, participants of Summer 1975 SSIs were sent a questionnaire on the Degree of Implementation (Form A-7). This questionnaire contained a list of statements and questions on the implementation, usefulness of the summer training program and problems encountered by the teachers in their actual teaching.

Discussion of Results

The total number of respondents for this questionnaire was 498. However, data from only 340 respondents, those with complete data for the independent variables, were used for this report.

a. The Recomputed Degree of Implementation.

The manner of determining the degree of implementation was restudied and recomputed as follows: the responses to items 10, 19, and 23 of the questionnaire were assigned points based on the perceived importance of the items concerned and were summed up for each teacher participant. The assignment of points to the responses is purely arbitrary and may be the source of weakness in the subsequent analysis of the instrument.

The points used are as follows:

<u>Factor C*</u>	<u>Points Assigned</u>	<u>Responses</u>
Number of lessons in UPSEC book followed	5	= very few (less than 1/4)
	10	= about 1/4 of the lessons
Item 10. For the chapters that you have taken up in class, approximately how many of the lessons in the UPSEC text did you follow in class?	20	= about 1/2 of the lessons
	30	= about 3/4 of the lessons
	40	= almost all

<u>Factor D</u>	<u>Points Assigned</u>	<u>Response</u>
Number of lessons (out of 100)	5	= 1 - 20
	10	= 21 - 40
Item 19. Assuming that there are 100 lessons available for your class from the UPSEC materials and considering the many problems you have in implementing the course, approximately how many of the available lessons are you able to present in your class?	20	= 41 - 60
	30	= 61 - 80
	40	= 81 - 100

<u>Factor E</u>	<u>Points Assigned</u>	<u>Response</u>
Percentage of what was learned during the training implemented	5	= about 20%
	10	= about 40%
Item 23. Approximately what percent of what you learned in the RSTC In-Service Training are you able to implement in your class?	20	= about 60%
	30	= approximately 80%
	40	= almost all

*The assignment of factors used in Progress Report No. 3 has been retained.

With the assigned points in each item, the maximum number of points for the degree of implementation for a teacher is 120. Table 65 shows the mean values and the standard deviation of the different factors and the degree of implementation for all participants grouped by subject area.

Table 65

Mean and S.D. of Factors C, D, and E and
the Degree of Implementation

Subject	C. No. of lessons (in UPSEC book) followed		D. No. of lessons (out of 100) implemented		E. Percentage of what has learned during the training implemented		Degree of Implementation	
	Mean*	S.D.	Mean*	S.D.	Mean*	S.D.	Mean**	S.D.
Physics n = 75	35.76	7.01	28.77	9.26	29.18	8.93	93.71	19.05
Chemistry n = 68	36.74	7.04	25.71	8.93	28.81	8.38	91.26	16.81
Biology n = 69	32.84	7.82	24.21	7.47	26.69	7.89	83.74	16.32
General Science n = 58	30.88	12.17	20.94	9.32	26.29	10.62	78.12	23.45
Mathematics n = 70	35.14	8.97	27.50	8.86	28.41	9.07	91.05	20.60

*Highest is 40 points

**Highest is 120 points

To test whether the mean values obtained for the degree of implementation of the different subject areas were significantly different from one another or not, an analysis of variance was performed. This analysis of variance yielded an F-ratio which was significant at the 0.001 level, meaning that at least one pair of means was significantly different. To find out which pairs contribute to this significant result, the Scheffe' method of multiple comparisons was done. The Scheffe' method consists of determining the S_e (experimental Scheffe') and the S_c (critical Scheffe') values for each pair. If the S_e

value is greater than the S_c value, then the two means are significantly different. Table 66 shows the results obtained.

Table 66
Results of the Scheffe' Method
of Multiple Comparisons

Subject Area	S_e	S_c	Significance
Physics - Chemistry	0.77	3.08	N.S.
Physics - Biology	3.15	3.08	*
Physics - General Science	4.67	3.64	**
Physics - Mathematics	0.84	3.08	N.S.
Chemistry - Biology	2.29	3.08	N.S.
Chemistry - General Science	3.81	3.64	**
Chemistry - Mathematics	0.06	3.08	N.S.
Biology - General Science	1.65	3.08	N.S.
Biology - Mathematics	2.26	3.08	N.S.
General Science - Mathematics	3.80	3.65	**

**Significant, $p < 0.01$

*Significant, $p < 0.05$

N.S. - not significant

The results show that there are significant differences in the degrees of implementation between the Physics-Biology and the Physics-General Science groups in favor of Physics, between the Chemistry-General Science groups in favor of Chemistry, and between the General Science-Mathematics groups in favor of Mathematics. This implies that the Physics, Chemistry, Biology and Mathematics programs are generally better implemented than the General Science program.

An examination of Table 65 shows the values for factors C and D of the General Science group to be quite low compared to those of the other groups. Since these factors involve the use of the UPSEC materials, it is quite possible that the existence of the Integrated Science and the Environmental Science texts has caused some confusion in the field. Some teachers used only one of these textbooks while others chose topics from both.

b. Independent Variables for Simple and Multiple Correlation with Degree of Implementation.

Six independent variables were chosen for correlation with the degree of implementation. The variables and the codes used for each one are as follows:

<u>Variable</u>	<u>Code</u>
1. Number of years teaching (Chemistry, Physics, etc.)	Actual number of years
2. Residual gains*	Actual computed values

*Residual gain is defined as the difference between a predicted score ($Y' = a + bX$) and the actual posttest score (Y), or $Y - Y'$ where

Y' = predicted posttest score
 a = Y intercept of the regression line
 b = slope of the regression line
 X = actual pretest score
 Y = actual posttest score

For each discipline, a single linear regression equation is generated using the results of the pretest and the posttest of all the teachers in the four Centers. The linear regression equations are shown in Table 26, page 44 of this report.

<u>Variable</u>	<u>Code</u>
3. Support from administrators,	1 = not helpful
Item 8: Has your high school principal been helpful in implementing what you learned from the RSTC In-Service training program?	2 = somewhat helpful
	3 = moderately helpful
	4 = very helpful
4. Number of students with UPSEC books,	1 = very few (less than 1/4)
Item 9: How many students in your class have the UPSEC book?	2 = about 1/4 of the class
	3 = about 1/2 of the class
	4 = about 3/4 of the class
	5 = almost all students
5. Amount of equipment available	2 = very few (less than 1/4)
Item 11: How much of the equipment needed for the UPSEC course that you are teaching are available to your class?	4 = about 1/4
	6 = about 1/2
	8 = about 3/4
	10 = almost all
6. Total posttest score (The results of the teachers' cognitive test administered at the end of Summer 1975)	Actual Score of Teacher

The means and S.D.s for variables 1, 3, 4, 5 and 6 are shown in Table 67.

Table 67

Mean and S.D. of Independent Variables Correlated
with the Degree of Implementation

Subject	Variable 1		Variable 3		Variable 4		Variable 5		Variable 6	
	Number of Years Teaching		Support from Administrators		Number of Students with Books		Amount of Equipment Available		Total Post-test Score	
	Mean	S.D.	Mean ³	S.D.	Mean ⁴	S.D.	Mean ⁵	S.D.	Mean ⁶	S.D.
Physics n = 75	5.04	3.35	3.41	0.80	3.45	1.45	6.14	2.60	36.23	8.83
Chemistry n = 68	2.54	1.89	3.40	0.79	3.16	1.55	6.87	2.47	29.60	6.33
Biology n = 69	5.54	4.27	3.36	0.68	3.32	1.55	6.26	2.49	41.49	4.79
General Science n = 58	5.68	4.57	3.29	0.89	2.64	1.66	6.57	2.66	29.52	4.62
Mathematics n = 70	3.60	3.22	3.42	0.82	2.86	1.71	6.32	3.05	19.12	3.81

³Highest value = 4⁴Highest value = 5⁵Highest value = 10

⁶Highest value: Physics = 60
Chemistry = 50
Biology = 50
General Science = 46
Mathematics = 30

Table 67 shows that about half of the students in all five groups have no books and approximately 60% of the needed equipment are available. The teacher participants appear to be well supported by their administrators. It is not at all surprising that Chemistry teachers have the least teaching experience. It was only in 1973 when the subject was made compulsory in our high schools.

The degree of implementation was correlated with six independent variables. Both simple and multiple correlations were done and the results are shown in Tables 68 to 72. The following are guidelines for interpreting the tables:

(1) Simple correlation

Simple r is the Pearson Product Moment of correlation between the independent variables or the selected six variables and the dependent variable or the degree of implementation.

Generally, a high positive correlation between an independent and a dependent variable implies that the independent variable is a good predictor of the dependent variable. A good characteristic of an independent variable is that it should correlate highly with the dependent variable.

(2) Multiple correlation

Multiple r is the correlation between the dependent variable and the linear combination of the independent variables. The higher the correlation, the better is the ability of the independent variables taken together to predict or estimate the dependent variable.

In all multiple regression tables, the variables are arranged in such a way that the best predictors appear on top and the least at the bottom.

(3) Increase in r^2

Increase in r^2 represents the percent of variance that may be attributed to the predicting ability of an independent variable. If the addition of another independent variable results in a large increase in r^2 , then that added variable contributes greatly to the total variance of the dependent variable.

(4) Percentage of Total Variance Accounted For

For each table, the percentage of total variance that can be accounted for by the independent variables is given. The greater the percentage of the total variance accounted for, the greater is the predicting ability of the independent variables taken altogether.

c. Predicted Degree of Implementation, y' .

The dependent variable or the degree of implementation in this case may be predicted from the independent variables by the use of the multiple regression equation given after each table. The values of the independent variables (as specified in the code) are simply substituted in the equation to get the predicted value of the dependent variable. Two examples are given below to show how the predicted degree of implementation, y' , may be obtained for a given teacher.

Example A:

Physics (Actual Degree of Implementation, $y = 100$)

$$y' = 24.63 + 2.46(x_1) + 2.12(x_2) - 1.67(x_3) + \\ 5.52(x_4) - 2.73(x_5) - 0.22(x_6)$$

$$x_1 = 8$$

$$x_4 = 4$$

$$x_2 = 37$$

$$x_5 = 4$$

$$x_3 = 15.33$$

$$x_6 = 8$$

$$y' = 24.63 + 2.46(8) + 2.12(37) - 1.67(15.33) \\ 5.52(4) - 2.73(4) - 0.22(8) \\ = 106.55$$

Example B:

General Science (Actual Degree of Implementation = 75)

$$y' = 22.21 + 3.54(x_1) + 1.26(x_2) - 1.44(x_3) + \\ 1.53(x_4) - 1.63(x_5) + 0.47(x_6)$$

$$x_1 = 4$$

$$x_4 = 4$$

$$x_2 = 24$$

$$x_5 = 3$$

$$x_3 = 7.39$$

$$x_6 = 10$$

$$y' = 22.21 + 3.54(4) + 1.26(24) - 1.44(7.39) + \\ 1.53(4) - 1.63(3) + 0.47(10) \\ = 61.90$$

Table 68
Multiple Regression Table for
Degree of Implementation
of Physics

No. of teachers = 75

Notation	Variables	Multiple		Increase in r^2	Simple r
		r	r^2		
X_1^*	Amount of equip- ment available	0.39	0.15	0.15	0.39
X_2	Total posttest score	0.50	0.25	0.09	0.37
X_3	Residual gains	0.53	0.28	0.04	0.27
X_4^*	Support from administrators	0.56	0.31	0.03	0.26
X_5^*	Number of stu- dents with textbooks	0.59	0.35	0.03	0.08
X_6	Years of teach- ing Physics	0.59	0.35	0.00	0.13
Total variance of the degree of implementation accounted for by the six variables = 35%					

Predicted degree of implementation (Y'),

$$Y' = 24.63 + 2.46(X_1) + 2.12(X_2) - 1.67(X_3) + 5.52(X_4) \\ - 2.73(X_5) - 0.22(X_6)$$

*please refer to pages 108 and 109 for codes used
for variables.

Table 69
Multiple Regression Table for
Degree of Implementation
of Chemistry

No. of teachers = 68

Notation	Variables	Multiple		Increase in r^2	Simple r
		r	r^2		
X_1^*	Amount of equipment available	0.39	0.15	0.15	0.39
X_2	Years of teaching Chemistry	0.43	0.19	0.03	0.20
X_3^*	Support from administrators	0.45	0.21	0.02	0.25
X_4	Total posttest score	0.46	0.21	0.00	-0.10
X_5	Residual gains	0.46	0.21	0.00	-0.11
X_6^*	Number of students with textbooks	0.46	0.21	0.00	0.18

Total variance of the degree of implementation accounted for
by the six variables = 21%

Predicted degree of implementation (Y'),

$$Y' = 67.92 + 2.42(X_1) + 1.53(X_2) + 3.07(X_3) - 0.32(X_4) \\ + 0.18(X_5) - 0.17(X_6)$$

*Please refer to pages 108 and 109 for codes used for
variables.

Table 70

Multiple Regression Table for
Degree of Implementation
of Biology

No. of teachers = 69

Notation	Variables	Multiple		Increase in r^2	Simple r
		r	r^2		
X_1^*	Amount of equipment available	0.36	0.13	0.13	0.36
X_2^*	Support from administrators	0.43	0.18	0.05	0.31
X_3	Total posttest score	0.45	0.20	0.02	-0.20
X_4	Years of teaching Biology	0.45	0.20	0.00	-0.14
X_5^*	Number of students with textbooks	0.45	0.20	0.00	0.14
X_6	Residual gains	0.45	0.20	0.00	-0.17

Total variance of the degree of implementation accounted for
by the six variables = 20%

Predicted degree of implementation (Y'),

$$Y' = 70.52 + 1.98(X_1) + 5.48(X_2) - 0.31(X_3) - 0.20(X_4) \\ - 0.45(X_5) - 0.17(X_6)$$

*Please refer to pages 108 and 109 for codes used for
variables.

Table 71

Multiple Regression Table for
Degree of Implementation
of General Science

No. of teachers = 58

Notation	Variables	Multiple		Increase in r^2	Simple r
		r	r^2		
X_1^*	Amount of equipment available	0.40	0.16	0.16	0.40
X_2	Years of teaching General Science	0.48	0.23	0.07	0.30
X_3^*	No. of students with textbooks	0.49	0.24	0.01	0.14
X_4	Total posttest score	0.49	0.24	0.00	0.13
X_5	Residual gains	0.51	0.26	0.02	0.02
X_6^*	Support from adminis- trators	0.51	0.26	0.00	0.21

Total variance of the degree of implementation accounted
for by the six variables = 26%

Predicted degree of implementation (Y'),

$$Y' = 22.21 + 3.54(X_1) + 1.26(X_2) - 1.44(X_3) + 1.53(X_4) \\ - 1.63(X_5) + 0.47(X_6)$$

*Please refer to pages 108 and 109 for codes used for
variables.

Table 72
Multiple Regression Table for
Degree of Implementation
of Mathematics

No. of teachers = 70

Notation	Variables	Multiple		Increase in r^2	Simple r
		r	r^2		
X_1^*	Support from administrators	0.31	0.09	0.09	0.31
X_2^*	Amount of equipment available	0.37	0.14	0.04	0.26
X_3	Years of teaching Mathematics	0.44	0.19	0.05	0.22
X_4	Total posttest score	0.46	0.21	0.01	0.17
X_5^*	Number of students with textbooks	0.46	0.21	0.00	0.25
X_6	Residual gains	0.46	0.21	0.00	0.13

Total variance of the degree of implementation accounted
for by the six variables = 21%

Predicted degree of implementation (Y'),

$$Y' = 39.59 + 6.18(X_1) + 1.30(X_2) + 1.25(X_3) + 1.08(X_4) \\ + 1.03(X_5) - 0.58(X_6)$$

*Please refer to pages 108 and 109 for codes used for variables.

An examination of Tables 68 to 72 show that, generally, the amount of equipment available and support from administrators have greater correlation with the degree of implementation than the other variables. Of the four remaining variables, the total posttest score and residual gains have relatively lower correlation values with the degree of implementation than years of teaching and number of students with textbooks. It appears, therefore, that the trained teachers, by themselves, may have minimal effect on the needed changes in our science courses without the help and support of their school administrators and material aid in the form of equipment.

Tables 68 to 72 further show that the six variables can account for only about 35% of the degree of implementation. This is practically the same value previously obtained and reported in Progress Report No. 3. Because of this, another independent variable, incentives given, was included in a later analysis. Still, no increase in the total variance was obtained.

Summary

The computed degree of implementation for each subject area are: Physics, 93.7; Chemistry, 91.3; Biology, 83.7; General Science, 78.1; and Mathematics, 91.0. The maximum possible score is 120. Results of correlation between these values (using the Scheffe' Method) show that the Physics, Chemistry, Biology and Mathematics programs are better implemented than the General Science program.

A multiple correlation between the degree of implementation and six variables (support from administrators, amount of equipment available, years of teaching, total posttest score, number of students with textbooks, residual gains) was performed. The results show that amount of equipment available and support from administrators have greater correlation with the degree of implementation than the other variables. Of the four other variables, total posttest score and residual gains have lower correlation values with the degree of implementation than years of teaching and number of students with textbooks.

6. Learning Environment Scale

A questionnaire entitled "Learning Environment Scale" (Form F-5) was administered to both Experimental and Control students. Previous studies have shown that student perception of classroom learning environment can be measured reliably and that environmental measures are valid predictors of learning.* The evaluation placed particular emphasis on the way the high school students themselves perceive the learning environment. As stated by Anderson and Walberg,** "The student is the intended recipient of instruction and other cues in the classroom, particularly social stimuli, and he may be the best judge of the learning context. Compared with a short-term observer, he weighs in his judgment not only the class as it presently is but how it has been since the start of the school year. He and his classmates form a group of several sensitive, and well-informed judges of the class; an outside observer is a single judge who has far less data and though highly trained and systematic, may be insensitive to what is important in a particular class."

In analyzing the Learning Environment Scale (LES) data, the class was taken as the unit (rather than the individual students). The LES contains sixty (60)

*Walberg, H.J., "Predicting Class Learning, A Multivariate Approach to the Class as a Social System." American Educational Research Association 4 (1969), 529-42.

**Anderson, G.J., Walberg, H.J., "Learning Environments" Evaluating Educational Performances, Walberg, H.J., Editor McCutchan Publishing Corporation. 2526 Gtve Street, Berkeley, California.

statements which describe classroom conditions. The students respond by indicating their agreement or disagreement with each statement using a four-point scale. The statements represent eight different factors, namely: (1) cohesiveness, (2) satisfaction, (3) organization, (4) affinity, (5) lesson, (6) competitiveness, (7) physical environment, and (8) teacher factor. Each factor is briefly explained below.

1. Cohesiveness

A feeling of intimacy which may develop when several individuals interact for a period of time; this property separates members of the group from non-members (six items).

2. Satisfaction

Enjoyment or liking for the subject and general transactions in the class (six items).

3. Organization

Students' perception of orderliness, efficiency and smoothness of class activities (six items).

4. Affinity

Complement of cohesiveness; indicates whether the students have feelings of affinity with or apathy towards class members and class activities (six items).

5. Lesson

Clarity of presentation of lessons and diversity of methods used (six items).

6. Competitiveness

Wanting to do better than other members of the class (six items).

7. Physical Environment

Appearance, sufficiency of space in the classroom, and availability of equipment and other teaching aids (twelve items).

8. Teacher

Students perception of their teacher; primarily done for comparison of Experimental and Control classes (twelve items).

Table 73 is a list of the statements grouped according to factors. Items with asterisks are negative statements. Scoring for these negative items was reversed.

Table 73

List of Statements Grouped According to Factors

Factor	Item Number	Statement
I. Cohesiveness	1	Students in our class help each other.
	11	Each student knows all the other students in our class.
	21	Members of our class are personal friends.
	31	All students know each other very well.
	41*	Students do not know each other well enough
	51*	Only a few members of the class know each other very well.
II. Satisfaction	3	We enjoy our class.
	13*	Many students are dissatisfied with most of what is done in class.

Factor	Item Number	Statement
II. Satisfaction	23	Most students do not like to be absent from class
	33	After the class, the students have a feeling of satisfaction.
	43	Students are well-satisfied with the work done in class.
III. Organization	4	There are long periods during which students do nothing.
	14*	Students who have nothing to do disturb the class work.
	24*	Most class activities are <u>not</u> organized.
	34	Our class usually goes on smoothly.
	44*	Many class members are confused during class meetings.
	54*	There is much confusion during class meetings.
IV. Affinity	5*	Lack of achievement does not bother the members of the class.
	15*	Members of the class do not care what other students do.
	25	Most students would like the other members of the class to do well.
	35	Most students sincerely want the class to be a success.
	45*	Lack of achievement would mean nothing to most members of our class.
	55*	Students do <u>not</u> care about what others <u>do</u> in class

Factor	Item Number	Statement
V. Lesson	7	The objectives of the lessons are clear to most students.
	17	Different methods are used in the presentation of the lessons.
	27	Lessons are presented clearly.
	37	Assignments are helpful in understanding the lessons.
	47	Our lessons are interesting.
	57	Most students are able to follow the lessons.
VI. Competitiveness	8	Most students want to do better than the other members of the class.
	18	Students compete for the best work.
	28*	Only a few members of the class try to do better than the others.
	38	Students feel left out unless they compete with their classmates.
	48*	Most students cooperate rather than compete with one another.
	58	There is much competition in class.
VII. Physical Environment	2	The equipment and apparatus which students need are in the classroom.
	9	Textbooks are available to most students.
	12	The students would be proud to show our classroom to visitors.
	19	Our classroom is comfortable.
	22	There are science/mathematics displays around the room.

Factor	Item Number	Statement
VII. Physical Environment	29*	Our classroom is too crowded.
	32	There is enough room for both individual and group work.
	39	Our room is kept neat and clean.
	42	Most apparatus and equipment are in working condition.
	49	We have enough apparatus for use during experiments.
	52	Audio-visual aids (charts, pictures, etc.) are used in the classroom.
	59	Most of the supplies needed for our experiments are available.
VIII. Teacher	6	Our teacher makes use of various teaching aids.
	10	Lively discussions are encouraged by our teacher.
	16	Our teacher explains clearly.
	20	Our teacher answers our questions clearly.
	26	Our teacher makes students more interested about the subject.
	30	Our teacher encourages independent thinking.
	36	Our teacher encourages all students to do their best.
	40	Our teacher inspires students to do better.
	46	Our teacher is enthusiastic in his teaching.
	50	Our teacher knows the subject very well.
	56	Our teacher encourages students to ask questions.
	60	Our teacher comes to class well-prepared.

Discussion of Results

This questionnaire was administered to the students of both Experimental and Control classes. A random sample consisting of 50% of the students of each class was asked to respond to the questionnaire. Responses were made using a four-point scale which were assigned corresponding scores. The following codes were assigned to positive statements:

Strongly Agree	= 4
Agree	= 3
Disagree	= 2
Strongly Disagree	= 1

For negative statements, scoring was reversed and the following codes were used:

Strongly Agree	= 1
Agree	= 2
Disagree	= 3
Strongly Disagree	= 4

In the study of the learning environment and transactions in the classroom, individual responses are interdependent. Responses of students may be affected by other students' responses since answers are based on interpersonal reactions. Perception of the environment as a group gives a better description of the characteristics of a class than individual responses. For these reasons, class means are better estimates than individual responses. Class means for each factor were used in the analysis of the Learning Environment Scale.

a. Correlation of LES Factors and Achievement Test Scores.

Each factor of the Learning Environment Scale (LES) was correlated with achievement test scores. Correlation of these factors were done in each subject for the combined group of Experimental and Control classes. Table 74 shows the correlation coefficients of eight LES factors with the achievement test scores.

Table 74

Correlation of Achievement Test Scores and Each Factor of the Learning Environment Scale

Factor	Correlation Coefficients (r)				
	Physics n = 30	Chemistry n = 35	Biology n = 38	General Science n = 38	Mathe- matics n = 31
Cohesiveness	0.44*	0.30	0.40*	0.48**	0.45**
Satisfaction	0.53**	0.47**	0.23	0.31*	0.14
Organization	0.46**	0.54**	0.39*	0.17	0.22
Affinity	0.18	0.25	0.36*	0.19	0.17
Lesson	0.13	0.32	0.36*	0.41**	0.36*
Competitiveness	0.52**	0.39*	0.37*	0.39*	0.17
Physical Environment	0.47**	0.41*	0.37*	0.35*	0.27
Teacher	0.23	0.49**	0.52**	0.18	0.30

*Significant, $p < 0.05$

**Significant, $p < 0.01$

The factors with significant correlation values for each subject are possible predictors of achievement in that particular subject. For example, in Physics classes, the factors "Cohesiveness, Satisfaction, Organization, Competitiveness and Physical Environment" are highly correlated with achievement. Physics classes with high class means in these factors would probably have high class

means in the achievement test. Note that for Mathematics, only two factors are significantly correlated with the achievement test. The correlation coefficients between the Learning Environment Scale factors and the student achievement shown in Table 74 may be due to their common relationship with mental ability. To obtain a more realistic relationship between the LES factors and the student achievement, partial correlations were computed with the mental ability held constant.⁺ The partial correlations are shown in Table 75.

Table 75

Correlation of Achievement Test Scores and Each Factor of the Learning Environment Scale with Mental Vocabulary Ability Scores (MV) Partialled Out

Factors	Coefficient Correlations (r)				
	MV Partialled Out				
	Physics n = 30	Chemistry n = 35	Biology n = 38	General Science n = 38	Mathe- matics n = 31
Cohesiveness	0.33	0.03	0.10	0.40*	0.36*
Satisfaction	0.50**	0.41*	0.15	0.31*	0.10
Organization	0.43*	0.47**	0.31*	0.04	0.18
Affinity	0.21	0.12	0.22	0.08	0.12
Lesson	0.07	0.18	0.23	0.32*	0.31
Competitiveness	0.52**	0.33*	0.27	0.32*	0.17
Physical Environment	0.49**	0.36*	0.21	0.28	0.28
Teacher	0.07	0.35*	0.34*	0.11	0.22

*Significant, $p < 0.05$

**Significant, $p < 0.01$

Note that some factors which are significantly correlated with achievement test scores in Table 74 are no longer considered significant in Table 75. These are the factors

⁺Formula for correlation of y and x with z partialled out

$$r_{xy.z} = \frac{r_{xy} - r_{xz} r_{yz}}{\sqrt{1 - r_{xz}^2} \sqrt{1 - r_{yz}^2}}$$

greatly influenced by the mental ability of the students. The factors that remained significantly related to student achievement are therefore the more useful factors as predictors of the achievement test scores. With MV partialled, four factors in Physics, five in Chemistry, two in Biology, four in General Science, and only one in Mathematics are significantly correlated with the achievement test scores.

- b. LES Combined with MV. The Learning Environment Scale (LES) was used in combination with the Mental Vocabulary Ability Test (MV) scores. It is common practice to use the mental ability scores as a predictor of achievement. With the use of the Learning Environment Scale together with the Mental Vocabulary ability test scores, it was hoped that the prediction of the achievement test score could be enhanced.

A multiple correlation between achievement test scores and the combination of LES and MV scores was performed. The results of a multiple regression for the combined Experimental and Control classes are shown in Table 76.

Table 76

Correlation of Achievement Test Scores With
Mental Vocabulary Ability Scores and
Learning Environment Scale

Subject	Number of Classes	Simple Correlation (r) with Mental Vocabulary	Multiple Correlation (R) with Mental Vocabulary and Learning Environment Scale	Increase	Reliability of Achievement Tests. (Kuder-Richardson Formula 20)
Physics	30	0.55**	0.76**	0.21*	0.73
Chemistry	35	0.47**	0.71**	0.24**	0.72
Biology	38	0.61**	0.71**	0.10	0.81
General Science	38	0.41**	0.78**	0.37**	0.69
Mathematics	31	0.29	0.59**	0.30**	0.80

*Significant, $p \leq 0.05$

**Significant, $p \leq 0.01$

Except for Mathematics, the Mental Vocabulary Ability Test scores correlated significantly with the Achievement Test scores. With the addition of the Learning Environment Scale, the multiple correlation in each subject became higher and even the value for Mathematics became significant. The increase for each subject were found to be significant except in Biology perhaps because of the fact that the simple correlation (r) with Mental Vocabulary was quite high to start with. The results for the multiple correlations (R) are very encouraging. This means that using LES in combination with MV increases the predictability of the achievement test scores. It is to be noted that the achievement tests used in this study were not standardized tests and their reliability coefficients are not as high as most standard tests. If standard tests were used, it is likely that the multiple correlation would be even higher.

The student perception of the learning environment has strong potentiality as a useful criterion in future educational evaluation. LES is convenient to administer and can be used for different areas including the social sciences. With adaptations, it could also be used in the collegiate and elementary levels.

- c. Comparison of Experimental and Control Classes on the Teacher and Physical Environment Factor. Of the eight factors included in the LES, two may have direct implications on the RSTC training; these are the Physical Environment and the Teacher factors. For these two factors the results for the Experimental and the Control classes were compared. For the Teacher factor, it was only in Physics that the average of all the Experimental classes were significantly higher than the average of the Control classes.

Table 77

Comparison of Teacher Factor for
Physics Classes

Experimental		Control		t-value
Mean	S.D.	Mean	S.D.	
3.334	0.271	3.150	0.174	2.442*

*p $\leq$ 0.05

This result implies that the students of the Experimental teachers perceive their teachers as being more confident, enthusiastic and knowledgeable in the subject matter compared to the Control teachers. This speaks well of the Physics training programs.

For the Physical Environment Factor, it was only in Chemistry that the average of the Experimental classes was significantly higher than the Control classes.

Table 78

Comparison of Physical Environment Factor for
Chemistry Classes

Experimental		Control		t-value
Mean	S.D.	Mean	S.D.	
2.934	0.266	2.758	0.22	2.103*

*p $\leq$ 0.05

Chemistry as a high school subject was introduced only recently. The results above imply that Chemistry teachers trained in the RSTCs are able to provide equipment, apparatus, materials for experiments and lessons better than the Control teachers. The training must have been instrumental in enabling

Experimental teachers to provide materials, logistics and methods for a basic Chemistry course. For the above reason, together with the fact that the increase in knowledge of most Chemistry teachers were significant, the sequential in-service program in Chemistry is highly recommended.

- d. Teacher Factor Correlation with Six Factors. Examination of the correlation of six factors (cohesiveness, satisfaction, organization, affinity, lesson, competitiveness) with the teacher factor shows interesting results. Using the combined results of Experimental and Control classes, the correlations are shown in Table 79.

Table 79

Correlation of Six LES Factors with the Teacher Factor

Factor	Correlation Coefficients (r)				
	Physics n = 30	Chemistry n = 35	Biology n = 38	General Science n = 38	Mathematics n = 31
Cohesiveness	0.16	0.36*	0.66**	0.80**	0.48**
Satisfaction	0.23	0.26	0.59**	0.54**	0.36**
Organization	0.49**	0.71**	0.74**	0.87**	0.52**
Affinity	0.49**	0.39*	0.60**	0.68**	0.56**
Lesson	0.63**	0.39*	0.50**	0.64**	0.62**
Competitiveness	0.30	0.62**	0.65**	0.77**	0.31

Note that for Physics three factors are significantly correlated with the Teacher factor. For Biology and General Science all six factors are highly correlated with the Teacher factor. For Mathematics and Chemistry five factors are significantly correlated with the Teacher factor. Those factors that are highly correlated with the Teacher factor can be used as a gauge of teacher perception by the students.

Lesson and Organization are highly correlated with the Teacher factor in all five subjects. This means that the students gauge their teachers by the clarity of the objectives of the lessons, variety of presentation, helpfulness of assignments, organization and efficient use of time.

- d. Multiple Regression Equations. Below are multiple regression equations for each subject which teachers may use for predicting the achievement test score of a particular class. The variables used to predict the achievement test scores are (1) the total score of LES and (2) the MV test scores. The MV test can be administered at the start of the school year and the LES three or four months later. The predicted class average can be calculated with the average LES scores and MV scores using the multiple regression equations.

An example is given below to illustrate how the predicted test score can be obtained. The example is taken from a Physics class.

<u>Notation</u>	<u>Variable.</u>	
LES	Class average of LES	23.89
MV	Class average of MV	33.29
Y	Actual class average of achievement test	19.87

The multiple regression equation for the predicted class average of the achievement test (Y') in Physics is given by:

$$Y' = -23.86 + 0.35 (MV) + 1.39 (LES)$$

Y' may be obtained by substituting the values of MV and LES above, thus

$$\begin{aligned} Y' &= -23.86 + 0.35(33.29) + 1.39(23.89) \\ &= -23.86 + 11.65 + 33.21 \\ &= 21.00 \end{aligned}$$

The predicted class average obtained with the use of the multiple regression equation was 21.00 which approximates the actual class average achievement test score of 19.87.

Note that the predicted value is not the same as the actual value but with the use of the multiple regression equation, a teacher can have an idea of the class average achievement test score (at the end of the year) as early as three or four months after the start of classes. The LES can also serve as a diagnostic test. Teachers may examine the factors in the LES which account for a low total LES score and could make the necessary changes in order to raise the total LES scores of the students.

The multiple regression equations for each subject are given below. These equations were obtained from the data of combined Experimental and Control classes.

Physics

$$Y' = -23.86 + 0.35 (MV) + 1.39 (LES)$$

Chemistry

$$Y' = -24.61 + 0.34 (MV) + 1.43 (LES)$$

Biology

$$Y' = -8.98 + 0.67 (MV) + 0.79 (LES)$$

General Science

$$Y' = -0.19 + 0.27 (MV) + 0.65 (LES)$$

Mathematics

$$Y' = -20.29 + 0.35 (MV) + 1.34 (LES)$$

III. LIST OF HIGH SCHOOLS WITH EXPERIMENTAL AND CONTROL CLASSES
IN THE EVALUATION STUDY

1. Agusan High School, Butuan City 8001
2. Alubiyid National Comprehensive High School,
Alubiyid, Misamis Oriental 8402
3. Assumpta Technical School, San Simon, Pampanga 2014
4. Assumption Academy, Compostela, Davao del Norte 9405
5. Assumption Academy, Manab, Davao del Norte 9411
6. Assumption Academy, Moncayo, Davao del Norte 9412
7. Assumption College, Nabunturan, Davao del Norte 9414
8. Ateneo de Davao (High School Dept.), Matina, Davao City 9501
9. Bais City High School, Bais City, Philippines
10. Bataan High School, Balanga, Bataan 1901
11. Batanes National High School, Basco, Batanes 1001
12. Batangas West High School, Lemery, Batangas 4205
13. Bicol College, High School Dept., Daraga, Albay 4912
14. Bohol Provincial High School, Tagbilaran City 6301
15. Bulacan College of Arts & Trades, Malolos, Bulacan 2601
16. Cadiz City High School, Cadiz City
17. Camarines Norte High School, Daet, Camarines Norte 4601
18. Catanduanes National High School, Virac, Catanduanes 5001
19. Catanduanes State Colleges, Virac Catanduanes 5001
20. Central Mindanao University, Jaro, Iloilo 5931
21. Colegio Del Sagrado Corazon de Jesus, Gen. Hughes St.,
Iloilo City
22. College of the Immaculate Concepcion, Cabanatuan City,
Nueva Ecija 2301
23. Columban College, Olongapo City, Zambales 2201
24. Dagupan City High School, Dagupan City 0401
25. Davao City High School, Davao City 9501
26. Davin Municipal High School, Davin, Negros Oriental
27. De Paul College, Jaro, Iloilo City 5931
28. Digos Provincial High School, Digos, Davao del Sur 9502
29. Divine Word College, Vigan, Ilocos Sur 0401
30. Dolores High School, Dolores, Eastern Samar 7018
31. Donsal National Comprehensive High School, Donsal, Sorsogon 5218
32. Dumaguete Cathedral High School, Dumaguete City
33. Eastern Mindoro College, Bongabon, Oriental Mindoro 4412
34. Eastern Samar High School, Borongan, Eastern Samar 7001
35. Fr. Urios High School, San Francisca, Agusan del Sur 8108
36. Fr. Villaverde High School, Villaverde, Nueva Viscaya 1503
37. Fellowship Baptist Academy, Kabankalan, Negros Oriental 6029
38. Fernando Air Base High School, Lipa City 4216
39. Foundation University, Dumaguete City
40. Good Shepherd's Fold Academy, Buenavista, Gumaras 5801
41. Gumaca Province High School, Gumaca, Quezon 3909
42. Hernani Municipal High School, Hernani Eastern Samar 7002
43. Holy Angel College, Angeles City, Pampanga 2017
44. Holy Child Academy, Pagadian City
45. Holy Cross College of Calinan, Davao City 9501
46. Holy Cross of Babak, Babak, Davao del Norte 9403
47. Holy Cross High School, Camp Philipp, Bukidnon 8215
48. Holy Cross School of Malita, Malita, Davao del Sur 9511
49. Holy Family Academy, Baguio City 0201
50. Holy Family Academy, San Jose, Occidental Mindoro 4305
51. Holy Rosary School, Pardo, Cebu City
52. ICHS, Jaro Extension, Fajardo Extension, Jaro, Iloilo
53. Iloilo High School, La Paz, Iloilo City 5901
54. Immaculate Academy, Malolos, Bulacan 2601
55. Janiuary National Comprehensive High School, Janiuary, Iloilo
56. John Bosco School, Mangagoy, Bislig, Surigao del Sur 8616
57. Kalahan Academy, Imugan, Sta Fe, Nueva Viscaya 1509

58. Koronadal National Comprehensive High School, Koronadal, South Cotabato
59. Larena National Vocational School, Larena, Siquijor, Negros
60. La Salle of Santiago, Santiago, Isabela 1322
61. Limay Municipal High School, Limay, Bataan 1909
62. Los Amigos Barangay High School, Los Amigos, Davao City 9501
63. Luis Hervias High School, Villamonte, Bacolod City
64. Magsaysay Memorial College, Pioneer Avenue, Gene Santos City
65. Marinduque School of Arts & Trades, Boac, Marinduque 3801
66. Maryknoll High School Cateel, Davao Oriental 9603
67. Maryknoll High School Gov. Generoso, Davao Oriental 9606
68. Maryknoll High School, Lambajon, Baganga, Davao Oriental 9602
69. Maryknoll High School Mabini, Davao del Norte 9409
70. Maryknoll High School, New Corella, Davao del Norte 9416
71. Maryknoll High School, Sto Tomas, Davao del Norte 9420
72. Miagao Vocational School, Miagao, Iloilo 5923
73. Mt. Carmel College, Escalante, Negros Occidental
74. Mt. Province General Comprehensive High School, Bontoc, Mt. Province 0601
75. Mt. State Agricultural College, La Trinidad, Benguet 0211
76. Moncayo Community High School, Moncayo, Davao del Norte 9412
77. Nabua High School, Nabua, Camarines Sur 4728
78. Nabunturan National Comprehensive High School, Nabunturan, Davao del Norte 9414
79. Negros Occidental Gen. Comprehensive High School, Bacolod City
80. Northern Luzon State College of Agriculture, Piat, Cagayan 1113
81. Notre Dame of Cotabato (Boys) Cotabato City
82. Notre Dame of Cotabato (Girls) Cotabato City
83. Notre Dame of Edcor, Alanada, North Cotabato
84. Notre Dame of Jolo, (Boy's Dept), Gandasuli, Jolo, Sulu
85. Notre Dame of Kabacan, Kabacan, North Cotabato
86. Notre Dame of Kiamba, Kiamba, South Cotabato
87. Notre Dame of Kidapawan (Girls) Kidapawan, North Cotabato
88. Notre Dame of Maasin, Maasin, South Cotabato
89. Notre Dame of Makilala, Makilala, North Cotabato
90. Notre Dame of Marbel (Girls), Koronadal, South Cotabato
91. Notre Dame of Matalam, Matalam, North Cotabato
92. Notre Dame of Midsayap (Boys), Midsayap, North Cotabato
93. Notre Dame of Midsayap (Girls) Midsayap, North Cotabato
94. Notre Dame of M'lang, M'lang, South Cotabato
95. Notre Dame of Norala, Norala, South Cotabato
96. Notre Dame of Parang, Parang, North Cotabato
97. Olongapo City National High School, Olongapo City 2201
98. Our Lady of Fatima Academy, Davao City 9501
99. Pablo Borbon Memorial Institute of Technology, Batangas City 4201
100. Pantukan Provincial High School, Pantukan, Davao del Norte 9418
101. Partido National High School, Goa, Camarines Sur 4710
102. Pinamungajan Provincial High School, Pinamungajan, Cebu 6440
103. Pridad Barangay High School, Crossing Bayabas, Davao City
104. Rizal Memorial College, Magallanes St., Davao City 9501
105. Roxas City School for Philippine Craftsmen, Loctugan Old Airport, Roxas City
106. Sacred Heart Academy, Garchitrena, Camarines Sur 4709
107. Sacred Heart College, Catbalogan, Samar 7301
108. Sacred Heart College, Lucena City 3901
109. Saint Antonio School, Aras-asan, Cagwait, Surigao del Sur 8602
110. Saint Augustine's School, Tagudin, Ilocos Sur 0433
111. Saint Bridget's College, Batangas City 4201
112. Saint Bridget's College, Buhí, Camarines Sur 4727
113. Saint Columban College, Pagadian City

114. Saint Columban Institute, Lingayen, Pangasinan 0702
115. Saint James High School, Buenavista, Agusan del Norte 8002
116. Saint Johns Academy, Camalig, Albay 4907
117. Saint Joseph's Academy, Sariaya, Quezon 3907
118. Saint Joseph's Community High School, Sapad, Lanao del Norte
119. Saint Joseph Seminary, Bangued, Abra 0101
120. Saint Joseph's Institute, Candon, Ilocos Sur 0413
121. Saint Joseph's School, Kiangnan, Ifugao 1202
122. Saint Joseph's School, Olongapo City, Zambales 2201
123. Saint Louis College, San Fernando, La Union 0501
124. Saint Louis, Balatac, Itogon, Benguet 0207
125. Saint Louis High School, Aurora Hill, Baguio City 0201
126. Saint Louis High School, Paodal, Baguio City 0201
127. Saint Louis School, Dumaguete City 6501
128. Saint Mary's College, Boys' Department, Tagum, Davao del Norte 9401
129. Saint Mary's School, Sagada, Mt. Province, Ifugao 0608
130. Saint Mary's Academy, Palo, Leyte 7118
131. Saint Paul's College, Vigan, Ilocos Sur 0401
132. Saint Peter's College, Toril, Davao City 9501
133. Saint Theresa's College, High School Department, Cebu City 6401
134. Saint Thomas Aquinas Academy, Sagod, Southern Leyte 7416
135. Samar School of Arts & Trades, Catbalogan, Samar 7301
136. San Isidro Municipal High School, San Isidro, Davao Oriental 9608
137. San Joaquin High School, San Joaquin, Iloilo 5926
138. San Miguel Community High School, San Miguel, Bohol 6337
139. San Francisco High School, Lamut, Ifugao 1206
140. San Sebastian College, Ricoletos, Cavite City 2705
141. Santa Cruz Institute, Sta. Cruz, Marinduque 3805
142. Santa Margarita Community High School, Sta. Margarita, Samar 7319
143. Santo Nifo Barangay High School, Bo. 13, Norala, South Cotabato
144. Santo Tomas Barangay High School, Sto. Tomas, Davao del Norte 9420
145. Santo Rosario High School, Pudtol, Kalinga, Apayao 1411
146. Stella Maris Academy, Bo. Obrero, Davao City 9501
147. Southern La Union National High School, Agoo, La Union 0507
148. Sultan Kudarat Provincial High School, Sultan Kudarat
149. Tacurong Municipal High School, Tacurong, Sultan Kudarat
150. Tarlac High School, Tarlac, Tarlac 2101
151. The College of Maasin, Maasin, Southern Leyte
152. Tupi Barangay High School, Tupi, South Cotabato
153. U.M. Guianga Junior College, Guianga, Tugbok, Davao City 9501
154. University of Northern Philippines, Vigan, Ilocos Sur 0401
155. Urdaneta Community High School, Urdaneta, Pangasinan 0737
156. Visayas State College of Agriculture, Baybay, Leyte 7127
157. West Negros College, Burgos St., Bacolod City 6001

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UP-NSDB PROJECT 7501 ED.

**"EVALUATION OF THE EFFECTS OF THE RSTC
PROGRAMS ON STUDENT PERFORMANCE"**

APPENDICES

APPENDICES

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I. Questionnaire for High School Administrators

SCIENTIFIC ATTITUDE AND SCIENCE TEACHING INVENTORY

In the following pages are some statements about science and science teaching. You may agree with some of the statements and you may disagree with the others. This is what you will be asked to do. By so doing you will show your attitude toward science and science teaching.

After you have carefully read a statement, decide whether you agree or disagree with it, either strongly or mildly. In answering each item use the following key:

1. Strongly Disagree (SD)
2. Disagree (D)
3. Uncertain (U)
4. Agree (A)
5. Strongly Agree (SA)

On your answer sheets, circle SD if you strongly disagree, D if you disagree, U if you are uncertain of how you feel, A if you agree and SA if you strongly agree with each statement given.

DO NOT WRITE ANYTHING ON THIS QUESTIONNAIRE. Please answer all items.

1. I would favor a science course with a minimum of laboratory work.
2. A science course should give more emphasis to the development of critical and logical thinking.
3. High school science courses would be useful only to those who will take up careers in engineering, science, and the like.
4. Scientists discover laws which tell us exactly what is going on in nature.
5. Laboratory experiments make science concepts clearer and more meaningful.
6. One of the most important objectives in the teaching of science is to be able to recall scientific facts.
7. The historical aspects of science should be given due emphasis.
8. Appreciation for science should be a major goal in the teaching of science.
9. The need for science courses among students who will take up law, commerce and the like, in college is minimal.
10. When something is explained well, there is no reason to look for another explanation.
11. Students should play an active role in performing laboratory experiments.
12. Scientific laws have been proven beyond all possible doubt.

13. If one or two scientists have evidence which appears to contradict current scientific belief, they are probably wrong.
14. One important function of teaching science is to train people to be critical thinkers, not believing everything they are told.
15. Demonstration experiment is more effective than the actual performance of experiments by the students.
16. Scientific laws cannot be changed.
17. When the findings or theories of science conflict with religious belief, it is better to accept the religious belief.
18. Performing laboratory experiments is a must for any science course.
19. In order to be more effective, local national leaders should know about recent major advances and developments in science.
20. A major purpose of science is to help man live more comfortably.
21. The only value of science is in its usefulness in solving practical problems.
22. Ideas are among the more important products of science.
23. When one asks questions in science, he gets information by observing natural phenomena.
24. Science helps rid people of superstitious fears.
25. There is little need for the general public to understand science.
26. Scientific findings should not be made public if they will create controversy.
27. All products of science are beneficial to mankind.

PHYSICS TEST

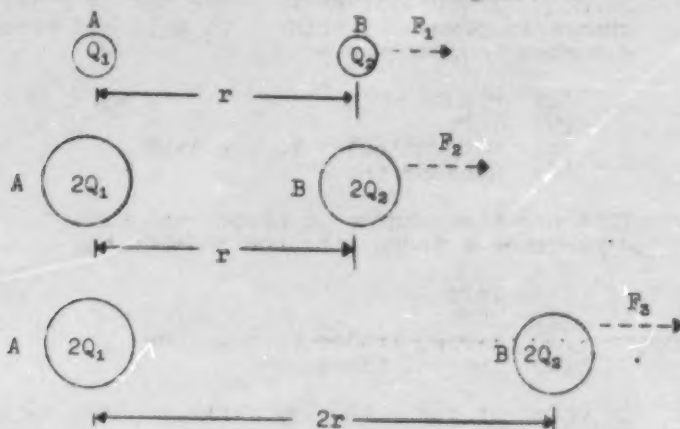
Directions:

You have $1\frac{1}{2}$ hours to answer the 60 items in this test. On a separate sheet of paper for every item, write the letter corresponding to the best answer.

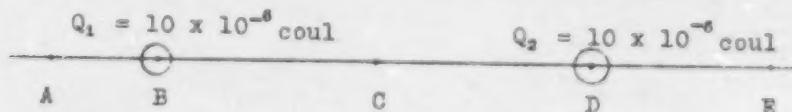
Do not open this booklet until you are told to do so.

Do not write anything on this test booklet.

- (1-2) Numbers 1 and 2 refer to the diagram below which show two bodies A and B of like charges.

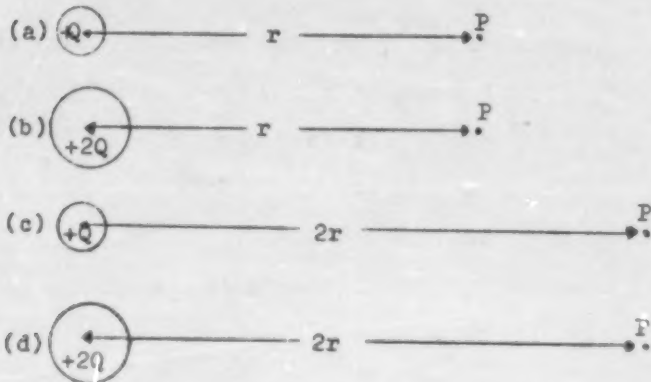


- Comparing F_1 and F_2 , choose the correct statement.
 - F_2 is twice F_1
 - F_2 is four times F_1
 - F_2 is one-half F_1
 - F_2 is equal to F_1
 - F_2 is one-fourth F_1
 - Comparing F_2 and F_3 , choose the correct statement.
 - F_3 is one-fourth F_2
 - F_3 is one-half F_2
 - F_3 is equal to F_2
 - F_3 is four times F_2
 - F_3 is twice F_2
- (3-5) Numbers 3 to 5 refer to the diagram below which shows a straight line AE with equal positive charges placed at points B and D.

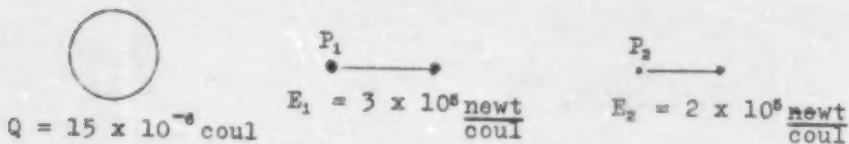


- If a positive charge is placed at point A it will experience a force directed towards the
 - right
 - left
 - perpendicular to the line
 - none of these

4. Point C is equidistant to B and D. If a positive charge is placed at point C it will experience a force directed towards the
- right
 - left
 - perpendicular to the line
 - none of these
5. If a negative charge is placed at point E, it will experience a force directed towards the
- left
 - right
 - perpendicular to the line
 - none of these
6. In which of the following diagrams is the magnitude of the field intensity greatest?

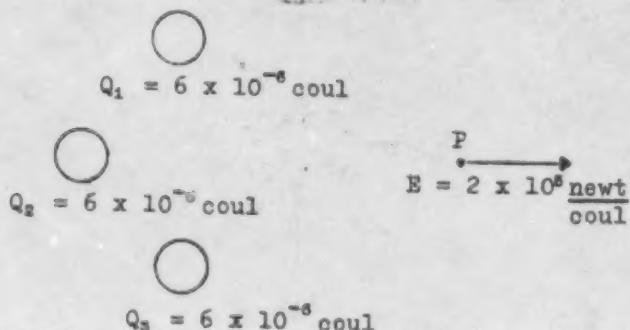


- (7-8) Refer to the diagrams below for numbers 7 and 8. The field intensity at points P_1 and P_2 are given.



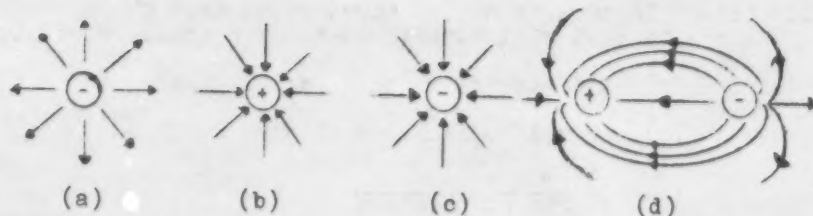
7. If a positive unit charge is placed at point P_1 it will experience a force equal to
- 3×10^5 newt to the right
 - 4.5 newt to the right
 - 5×10^{-11} newt to the left
 - 5×10^{-11} newt to the right

8. If a negative charge of -6 coulombs is placed at point P_1 , it will experience a force equal to
- 18 newt to the left
 - 45 newt to the left
 - 18 newt to the right
 - 12×10^5 newt to the left
9. The field intensity at point P due to the three given positive charges is shown below.

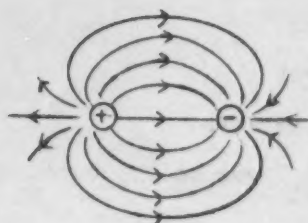


A unit positive charge placed at point P will experience a force numerically equal to

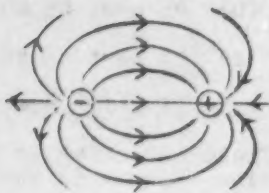
- 0.9 newt
 - 36 newt
 - 2×10^5 newt
 - 6×10^5 newt
10. Which of the following diagrams showing lines of force is correct?



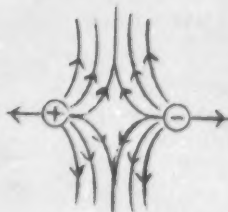
11. Which of the following diagrams showing lines of force is correct?



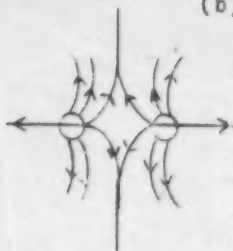
(a)



(b)



(c)



(d)

- (12-14) Numbers 12 to 14 relate to the information given below.

Two parallel plates are 4 cm apart. One plate is negatively charged while the other is positively charged. The potential difference between them is 200 volts.

12. The electric field intensity between the plates is equal to
- (a) 2×10^2 volt/m
 - (b) 50 volt/m
 - (c) 5×10^3 volt/m
 - (d) 8 volt/m
13. If an electron is placed anywhere between the plates the force that it will experience is numerically equal to
- (a) 5000 volt/m x charge of electron
 - (b) 50 volt/m x charge of electron
 - (c) $\frac{200 \text{ volt/m}}{\text{charge of electron}}$
 - (d) 125 volt/m x charge of electron

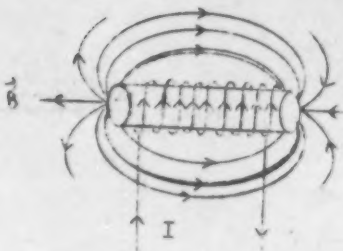
14. If an electron is accelerated from the negative to the positive plate, its kinetic energy will increase by

(a) 125 ev
(b) 20 ev
(c) .02 ev
(d) 200 ev

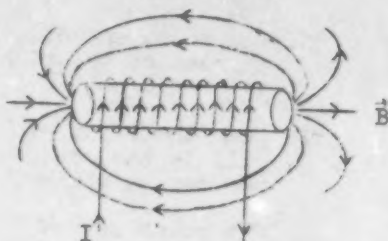
- (15-18) Match the letters on the right column which are effects on the resistance R of a wire with what is done to the wire stated on the left column from numbers 15 to 18.

15. Double the length	(a) Decreases R by four
16. Double the cross-sectional area	(b) Increases R by four
17. Double the radius	(c) Increases R by twp
18. Double the length and double the area	(d) Decreases R by two
	(e) No change in R

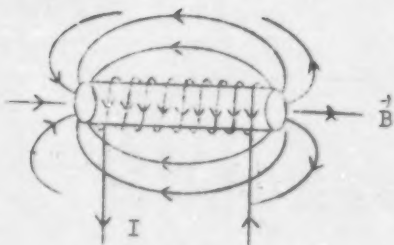
19. Which of the diagrams below is not correct? Magnetic lines of induction and direction of current are shown.



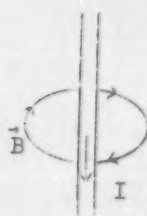
(a)



(b)



(c)



(d)



(e)

20. Choose the statement below which applies correctly to magnetic fields.

- (a) A wire placed parallel to the field will experience a force.
- (b) It may exert a force on a moving electric charge.
- (c) It has exactly the same property as an electric field.
- (d) Magnetic lines of induction drawn for it is always circular.

(21-25) Match the effects produced on the solenoid on the right column with the descriptions in numbers 21 to 25 on the left column. (A letter may correspond to more than one answer.)

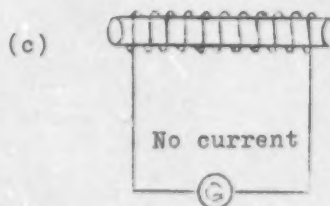
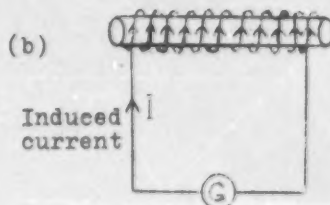
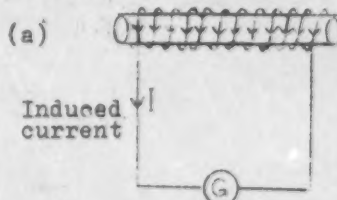
21. The north end of a bar magnet approaches the right end of the coil.

22. The north end of a bar magnet is being withdrawn from the right end of the coil.

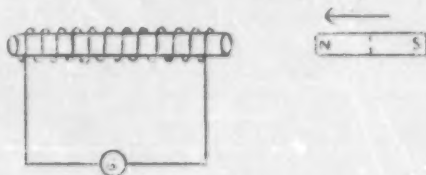
23. The south end of a bar magnet approaches the right end of the coil.

24. Near the right end of this coil is the south end of a bar magnet which is at rest.

25. The south end of a bar magnet approaches the left end of the coil.



Number 26 refer to the diagram below showing the north end of a bar magnet approaching the right end of a coil.



26. The magnetic flux through the coil due to the magnet is

- (a) increasing
- (b) decreasing
- (c) the same
- (d) zero.

27. Electromagnetic waves are generated in a wire when

- (a) the wire cuts through a magnetic field
- (b) the wire is connected to a dry cell or battery
- (c) electrons are accelerated in the wire
- (d) a loop is made out of the wire and is rotated in a magnetic field.

(28-32) Arrange the following regions of the electromagnetic spectrum in the order of increasing frequency.

- (a) infra-red region
- (b) X-rays
- (c) visible region
- (d) radio waves
- (e) gamma rays

min 28

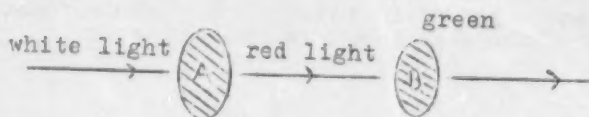
29

30

31

max 32

(33-34) Refer to the diagram below for numbers 33 and 34.



33. White light strikes a transparent sheet A resulting in red light coming out of A. Sheet A must have

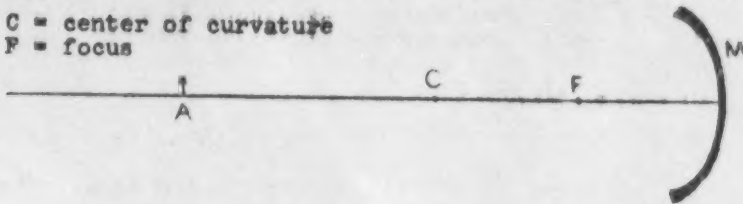
- (a) absorbed all visible light except red
- (b) added red color to the light
- (c) absorbed red light only
- (d) added all colors except red.

34. The red light now passes through a green sheet B. The light coming out of B will be

- (a) green
- (b) red
- (c) red and green
- (d) none of these

(35-37) The diagram below relates to numbers 35 to 37.

C = center of curvature
F = focus



35. If an object is placed at point A, the image will be located

- (a) between F and M
- (b) at F
- (c) somewhere to the left of F
- (d) somewhere to the right of M

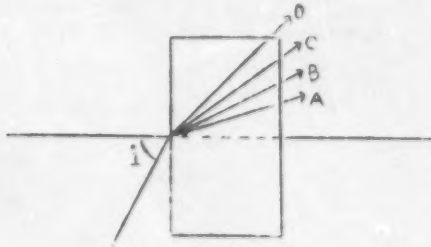
36. If an object is placed at C, the image will be located

- (a) between F and M
- (b) at C
- (c) to the left of A
- (d) to the right of M

37. If an object is placed between F and M, the image will be

- (a) virtual and inverted
- (b) real and erect
- (c) virtual and erect
- (d) real and inverted

(38-39) Numbers 38 to 39 refer to the diagram below which shows four colors striking the side of a glass plate at the same angle of incidence. They are refracted in different directions as shown by the rays A, B, C, and D.



38. The color corresponding to ray C has a wavelength

- (a) longer than the wavelength of D only
- (b) longer than the wavelength of D and B
- (c) longer than the wavelength of A and B
- (d) longer than the wavelength of A only

39. The frequency of the color corresponding to the ray B is
- (a) higher than the frequency of A only
 - (b) higher than the frequency of A and C
 - (c) higher than the frequency of C and D
 - (d) higher than the frequency of C only.

40. Decreasing the distance of separation between the two slits in Young's double slit experiment
- (a) produces narrower bands in the observed interference pattern
 - (b) decreases the wavelength of the light used
 - (c) produces wider bands in the observed interference pattern
 - (d) increases the wavelength of the light used.

Item No. 41 refer to the following information. Planck's constant h , charge of the electron e , and the work function of three metals are given below.

$$h = 6.62 \times 10^{-34} \text{ joule-sec}$$

$$e = 1.6 \times 10^{-19} \text{ coul}$$

Work function:

$$\text{Copper} = 6.56 \times 10^{-19} \text{ joule}$$

$$\text{Zinc} = 4.96 \times 10^{-19} \text{ joule}$$

$$\text{Sodium} = 3.35 \times 10^{-19} \text{ joule}$$

41. A photon having a frequency of 7×10^{14} /sec can eject electrons from
- (a) copper only
 - (b) both copper and zinc
 - (c) sodium only
 - (d) all three metals
42. An electron (mass = 9.1×10^{-31} kg) traveling with a speed of 1.1×10^7 m/sec has a wavelength associated with it equal to

- (a) 1.3×10^{-10} m
- (b) 0.66×10^{-10} m
- (c) 0.325×10^{-10} m
- (d) 2.6×10^{-10} m

43. Photons in the ultraviolet region having an energy of 6.2 eV is incident on silver metal which has a work function equal to 3.7 eV. The maximum energy of the electrons emitted out of the surface is

- (a) 2×10^{-19} joule
- (b) 4×10^{-19} joule
- (c) 7.74×10^{-19} joule
- (d) Zero

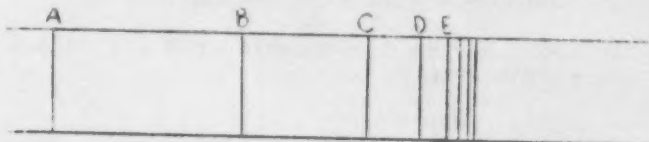
44. Which of the following statements is not correct?

- (a) Both electrons and photons can be diffracted.
- (b) All electrons have the same charge.
- (c) All photons have the same energy.
- (d) Both particle and wave properties can be associated with electrons.

- (45-47) Match the items on the right column with those on the left column in numbers 45 to 47.

- | | |
|--------------------------------------|--|
| 45. Shows wave property of light | (a) Diffraction of electrons by crystals |
| 46. Shows particle property of light | (b) Young's double slit experiment |
| 47. Shows wave property of electrons | (c) Emission of electrons from a wire by heating |
| | (d) Photoelectric effect |
| | (e) Reflection |

- (48-49) Numbers 48 and 49 refer to the diagram below which shows the Balmer series of the hydrogen spectrum.



48. The frequency of the line denoted by C is

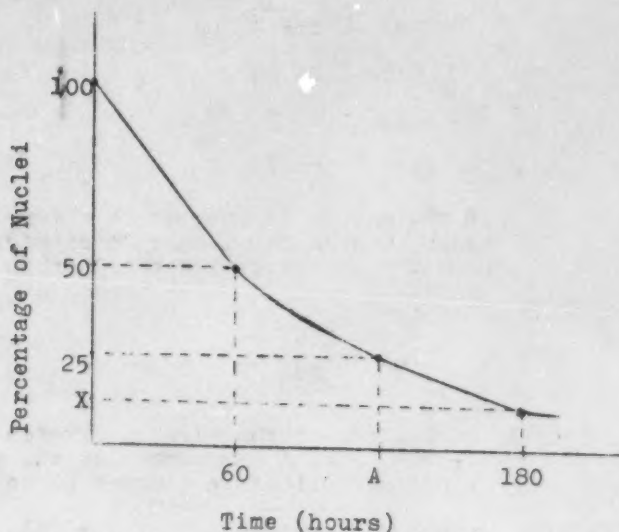
- (a) greater than the frequency of D and E
- (b) less than the frequency of A and B
- (c) greater than the frequency of A and B
- (d) none of the above

49. The line which results in line B is due to a jump from

- (a) $n = 4$ to $n = 1$
- (b) $n = 3$ to $n = 1$
- (c) $n = 3$ to $n = 2$
- (d) $n = 4$ to $n = 2$

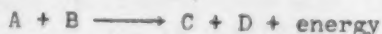
50. The first allowed radius (r) of the hydrogen atom is $0.528 \text{ \AA}$, the second allowed radius is $2.11 \text{ \AA}$. The third allowed radius (r) has a value of
- (a) $1.584 \text{ \AA}$
 - (b) $4.22 \text{ \AA}$
 - (c) $8.45 \text{ \AA}$
 - (d) $4.75 \text{ \AA}$
51. If the energy of the lowest allowed orbit ($n = 1$) of the hydrogen atom is given an arbitrary value of -13.6 eV , then the energy of the third orbit ($n = 3$) is
- (a) 4.5 eV
 - (b) -1.51 eV
 - (c) -4.53 eV
 - (d) -4.08 eV
- (52-54) An isotope of the element Krypton is designated as $^{78}_{36}\text{Kr}$. Match the number on the right column with the descriptions in numbers 52 to 54 on the left column.
- | | |
|------------------------|-------------|
| 52. number of protons | (a) 114 |
| | (b) 36 |
| 53. number of nucleons | (c) 78 |
| | (d) 42 |
| 54. number of neutrons | (e) $78/36$ |
55. When a radioactive element emits a beta particle.
- (a) both charge and mass do not change
 - (b) its charge increases by one and its mass increases by one
 - (c) its mass increases by one and the charge decreases by one
 - (d) its mass does not change but the charge increases by one.
56. When a radioactive element emits an alpha particle
- (a) its mass decreases by four and its charge decreases by one
 - (b) its mass increases by four and its charge increases by one
 - (c) its charge decreases by four and its mass decreases by two
 - (d) its mass decreases by four and its charge decreases by two.

(57-59) Numbers 57 to 59 relate to the diagram below which shows the graph to the percentage of a radioactive nuclei left against time.



57. The half life of the radioactive nuclei is equal to
- 30 hours
 - 60 hours
 - 180 hours
 - that time corresponding to A in graph.
58. By inspection of the graph, time A corresponds to
- 90 hours
 - 180 hours
 - 120 hours
 - 75 hours
59. The percentage X remaining after 180 hours is
- 20%
 - 15%
 - 12%
 - 12.5%

60. A nuclear reaction represented by the equation



takes place. From the reaction, we can say that

- mass of A is greater than mass of B
- mass of (A + B) is less than mass of (C + D)
- mass of (A + B) is greater than mass of (C + D)
- mass of (A + B) is equal to mass of (C + D).

CHEMISTRY TEST

Directions: You have 1 hour to answer the items in the test
Do not write anything on the item sheets. Your **answer** to
all questions are to be recorded on the separate answer sheet.

CHEMISTRY TEST

Directions: On your answer sheet write the letter corresponding to the best answer for each item.

1. Below are given the following data of the effect of concentration on the rate of a reaction. Which one is a second order reaction?

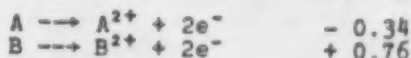
Concentration	Rate
a. doubled	8 times original rate
b. doubled	same as original rate
c. doubled	4 times original rate
d. doubled	2 times original rate

2. Which factor does not affect the rate of reaction of a metal with an acid?
- the temperature of the system
 - the atmospheric pressure
 - the concentration of the reactants
 - the surface area of the metal
3. $2A + B \rightleftharpoons 2C + \text{heat}$
Which factor would not affect the above system at equilibrium?
- increasing the concentration of A
 - heating the system
 - increasing the pressure
 - adding a catalyst.
4. In which of the following gaseous systems would a change in pressure have no effect on the equilibrium state?
- $2 \text{CO} + \text{O}_2 \rightleftharpoons 2 \text{CO}_2$
 - $2 \text{NO}_2 \rightleftharpoons \text{N}_2\text{O}_4$
 - $\text{CO} + \text{NO}_2 \rightleftharpoons \text{NO} + \text{CO}_2$
 - $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2 \text{NH}_3$
5. Which solid substance conducts electric current?
- graphite
 - sulfur
 - sodium chloride
 - sugar
6. To what is electrical conductance in metals due?
- shared electrons
 - transferred electrons
 - mobile electrons
 - lone pair electrons
7. When dilute NaCl solution is electrolyzed what substance is produced at the cathode?
- sodium
 - chlorine
 - oxygen
 - hydrogen

8. 3 amperes are passed for 32, 167 sec through molten AlCl_3 . What is the amount of Al deposited?

a. 10,723.5 g c. 27,000 mg
b. 96,501 g d. 9000 mg

9. The standard oxidation potentials for the electrodes A and B in 1M ion concentration of their salts in water at 25°C are



Which of the following is the cathode half cell reaction?

a. $\text{A} \longrightarrow \text{A}^{2+} + 2\text{e}^-$ - 0.34
b. $\text{A}^{2+} + 2\text{e}^- \longrightarrow \text{A}$ + 0.34
c. $\text{B} \longrightarrow \text{B}^{2+} + 2\text{e}^-$ + 0.76
d. $\text{B}^{2+} + 2\text{e}^- \longrightarrow \text{B}$ - 0.76

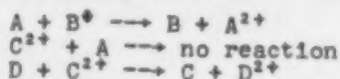
10. The standard oxidation potentials for the metals A, B, C and D are +1.66, -0.78, +0.76, -1.50 respectively. Which is the best oxidizing agent?

a. D c. C
b. A d. B

11. A solution of $\text{Pb}(\text{NO}_3)_2$ is to be prepared. Spatulas made up of the metals given below are available. Which one would you choose to stir the solution?

a. iron c. tin
b. silver d. nickel

12. A, B, C and D are four metals. Displacement reactions gave the following results,



Which of the arrangements of the metals is in increasing order of oxidation potentials?

a. A, B, C, D c. D, C, A, B
b. D, C, B, A d. B, A, C, D

13. Which of the following is a definition of a Lewis acid?

a. donors of H^+ ions
b. producers of H^+ ions by ionization
c. donors of an electron pair for coordination
d. acceptors of an electron pair for coordination

14. Which of the following is an example of a Bronsted Lowry acid?

a. NH_3 c. NH_4^+
b. AlCl_3 d. BH_3

15. X, Y, W and Z belong to the same period. Their sizes decrease and their electronegativities increase in the order given. Which hydroxy compound is the strongest acid?

a. Z	c. X
b. Y	d. W
16. A, B, C and D are elements of the same family and in increasing order of atomic numbers. Which acid is stronger?

a. HA	c. HC
b. HB	d. HD
17. Solutions of acid HW, HX, HY and HZ have hydrogen ion concentrations of 1×10^{-3} M/l, 1×10^{-3} M/l, 1×10^{-4} M/l, and 1×10^{-6} M/l respectively. Which is the most acidic?

a. HW	c. HZ
b. HX	d. HY
18. The hydrogen ion concentration of a solution is 1×10^{-3} . What is the pOH?

a. 11	c. 14
b. 3	d. 7
19. In which reaction does neutralization take place?

a. 1 mole of H_2SO_4 reacts with 1 mole of NaOH
b. 1 mole of H_2SO_4 reacts with $\frac{1}{2}$ mole of NaOH
c. $\frac{1}{2}$ mole of H_2SO_4 reacts with 1 mole of NaOH
d. $\frac{1}{2}$ mole of H_2SO_4 reacts with $\frac{1}{2}$ mole of NaOH
20. Given 30 ml of 0.2 M base. What is the number of moles in solution?

a. 6 moles	c. 0.6 mole
b. 0.006 mole	d. 60 moles
21. 30 ml of 0.5 M NaOH reacts with 10 ml of H_3PO_4 solution. What is the molarity of H_3PO_4 ?

a. 1.5 M	c. 0.15 M
b. 0.5 M	d. 0.00005 M
22. Cu, Ni, Ag, Au are treated with H_3PO_4 . Which metal gives off H_2 gas?

a. Cu	c. Au
b. Ag	d. Ni
23. Dil. H_2SO_4 , conc. H_2SO_4 , dil. HNO_3 , conc. HNO_3 , are made to react with Al. Which acid gives off H_2 gas?

a. dil H_2SO_4	c. dil. HNO_3
b. conc. H_2SO_4	d. conc. HNO_3
24. Which of the following does not give a net ionic reaction?

a. $\text{K}_2\text{CO}_3 + \text{HCl}$	c. $\text{BaCl}_2 + \text{Na}_2\text{SO}_4$
b. $\text{Ca}(\text{NO}_3)_2 + \text{NaCl}$	d. $\text{KOH} + \text{HCl}$

25. Which group of cations does not form complex ions?
 - a. cations that lack a noble gas configuration
 - b. cations that have a noble gas configuration
 - c. cations that have no noble gas configuration and a charge of 3^+ or more
 - d. transition metals
26. Which hydroxide is amphoteric or amphoteric?
 - a. $\text{Zn}(\text{OH})_2$
 - b. NaOH
 - c. $\text{Ca}(\text{OH})_2$
 - d. $\text{Fe}(\text{OH})_3$
27. Which salt solution is acidic?
 - a. NaCl
 - b. Na_2CO_3
 - c. $(\text{NH}_4)_2\text{SO}_4$
 - d. $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$
28. Which ion decreases the ionization of CH_3COOH ?
 - a. Cl^-
 - b. NO_3^-
 - c. SO_4^{2-}
 - d. CH_3COO^-
29. Which of the following is a buffer system?
 - a. $\text{H}_2\text{CO}_3 + \text{NaHCO}_3$
 - b. $\text{HCl} + \text{NaCl}$
 - c. $\text{H}_2\text{SO}_4 + \text{NaHSO}_4$
 - d. $\text{HNO}_3 + \text{NaNO}_3$
30. A solution contains a single cation. It is colorless, gives no color to flame, no precipitate with the reagents CH_3I , H_2SO_4 , NH_3 , NaOH , H_2S , HCl ; what ion is present?
 - a. Na^+
 - b. Fe^{3+}
 - c. NH_4^+
 - d. Ba^{2+}
31. An iron nail sealed in a test tube completely filled with boiled water hardly corrodes. A nail in unboiled water corrodes. A nail in a test tube of air with some anhydrous CaCl_2 hardly corrodes. What can one conclude from these observations about what is needed for corrosion?
 - a. cold water
 - b. air
 - c. water + air
 - d. sterile water
32. Iron corrodes faster when in contact with which of the following metals?
 - a. tin
 - b. zinc
 - c. magnesium
 - d. aluminum
33. To what is the stability of carbon compounds due?
 - a. atoms of carbon can combine with each other to form long chains.
 - b. no lone pairs are available for coordination.
 - c. covalent bonds are mainly formed.
 - d. they are derived from living organisms.
34. A sigma bond is the bond formed from electrons
 - a. in orbitals that overlap along their axes
 - b. in orbitals that overlap sidewise
 - c. that transfer from the orbital of one atom to the orbital of another
 - d. of an orbital of an atom shared with an empty orbital of another.

35. $\text{CH}_3\text{OCH}_2\text{CH}_3$ belongs to what class of organic compounds?
- ketones
 - aldehydes
 - alcohols
 - ether
36. What is the IUPAC name of $\text{CH}_3 - \underset{\text{CH}_2}{\underset{\text{CH}_3}{\text{CH}}} - \text{CH}_2 - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_3$?
- 2-ethyl, 4-methyl pentane
 - 2-methyl, 4-ethyl pentane
 - 3, 5-dimethyl hexane
 - 2, 4-dimethyl hexane
37. An organic compound is insoluble in water, soluble in 5% NaOH and insoluble in NaHCO₃. Identify the class of compound.
- a strong organic acid
 - a weak organic acid
 - an amino compound
 - an alcohol
38. A C, H, O, compound is insoluble in H₂O, 5% NaOH, 5% HCl but soluble in concentrated H₂SO₄ and H₃PO₄. When treated with Benedict's solution it gives a red precipitate. What is the class of the compound?
- an alcohol
 - a ketone
 - an aldehyde
 - an ester
39. What class of compounds is isomeric with alcohols?
- aldehydes
 - ketones
 - ethers
 - esters
40. To what type of isomers do alkenes and cycloalkanes belong?
- functional
 - position
 - geometric
 - optical
41. Which of the following compounds would be the most soluble in water?
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{CH}_3$
 - $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
42. Which of the following organic compounds is not a constituent of the human body?
- carbohydrates
 - hydrocarbons
 - proteins
 - lipids
43. The violet color with NaOH and CuSO₄ is a test for what class of compounds?
- carbohydrates
 - hydrocarbons
 - proteins
 - lipids
44. Of what monosaccharide is the disaccharide sucrose built?
- glucose and glucose
 - glucose and galactose
 - glucose and mannose
 - dextrose and fructose
45. What are the building blocks of proteins?
- carboxylic acids
 - amino acids
 - amides
 - amines

46. The xanthoproteic test is a test for what group?
- benzene ring
 - indole group
 - peptide group
 - S-S group
47. Which of the following is not a building block of DNA?
- ribose
 - a phosphate group
 - a heterocyclic base
 - deoxyribose
48. Which one of the following is not a probable linkage between protein chains?
- S-S
 - $\text{NH}_3^+ \text{ } ^-\text{OOC}$
 - $\begin{array}{c} \text{H} \\ | \\ -\text{N} - \text{C} - \\ | \quad \quad | \\ \quad \quad \text{O} \end{array}$
 - H-bonding
49. In what body molecules is energy stored?
- DNA
 - RNA
 - ADP
 - ATP
50. In what body activity are enzymes involved?
- supplying energy
 - catalysis
 - coding of amino acid sequence
 - sending messages in the body

BIOLOGY TEST

Directions:

There are 50 multiple choice items in this test and you have one hour to answer them. Read each question carefully and decide which is the best answer. On a separate answer sheet, write the letter corresponding to the best answer.

DO NOT WRITE anything on this test booklet.

ACHIEVEMENT TEST IN BIOLOGY

1. Which of the following sequence shows best how a scientist works?
 - A. observing, experimenting, measuring, reporting
 - B. experimenting, observing, measuring, reporting
 - C. measuring, observing, experimenting, reporting
 - D. observing, reporting, measuring, experimenting
2. Which of the following is not the activity of a scientist?
 - A. observing how ants build an anthill
 - B. explaining why the leaves of makah'ya close when touched
 - C. postponing a planned field trip because a cat crosses his path
 - D. explaining why seeds increase in size when placed in water.
3. Choose one statement that best illustrates irritability among living things.
 - A. swaying of bamboo when the wind blows
 - B. development of a tadpole into a frog
 - C. coiling of a millepede when touched with a stick
 - D. chicken scratching the ground for food

Numbers 4-8 are classification items. Using the key choose the property of living organisms illustrated by the following:

- Key:
- A. Structure
 - B. Metabolism
 - C. Irritability
 - D. Growth and development
 - E. Reproduction

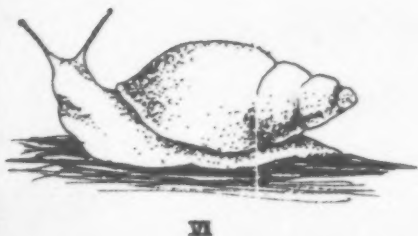
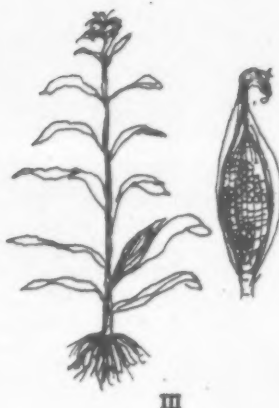
4. candy - energy for walking
5. caterpillar becoming a butterfly
6. mother cat and her kittens
7. skeleton of men
8. blinking of the eyes
9. Biological classification is basically determined by
 - A. similarities in structure only.
 - B. differences in structure only.
 - C. place where organisms live together.
 - D. similarities and differences in structure of organisms.

Below is a matching type test for items 10-13.

Directions: In the blank space after each statement in Column II choose the letter of the name of that branch of Biology in Column I that is described in the item in Column II.

- | Column I | Column II |
|-------------------|--|
| A. Taxonomist | 10. Prof. Guzman studies fossil remains of organisms and correlates them with the geologic period. He is a _____. |
| B. Physiologist | |
| C. Embryologist | 11. Carl von Linne was the first to group, classify and give names to organisms. A biologist who continues his work is known as _____. |
| D. Paleontologist | |
| | 12. In one research a biology professor dissected a rabbit. He studied its reproductive structure and he injected a certain substance to find out if the function of the reproductive organ will be affected. One who is engaged in a study of this kind is _____. |
| | 13. Dr. Galvez placed the egg of a sea urchin in an aquarium and studied the development of the sea urchin from the egg stage to the adult stage. He had done this kind of study with other organisms; hence he can be called _____. |
14. Of the following characteristics which does not describe a virus?
- A. It can reproduce.
 - B. It can undergo changes in hereditary characteristics.
 - C. It can be crystallized and stored.
 - D. It contains chlorophyll.

Items 15-17 refer to the organisms pictured below. These organisms can be classified in several different ways by using different features as the basis for classification.



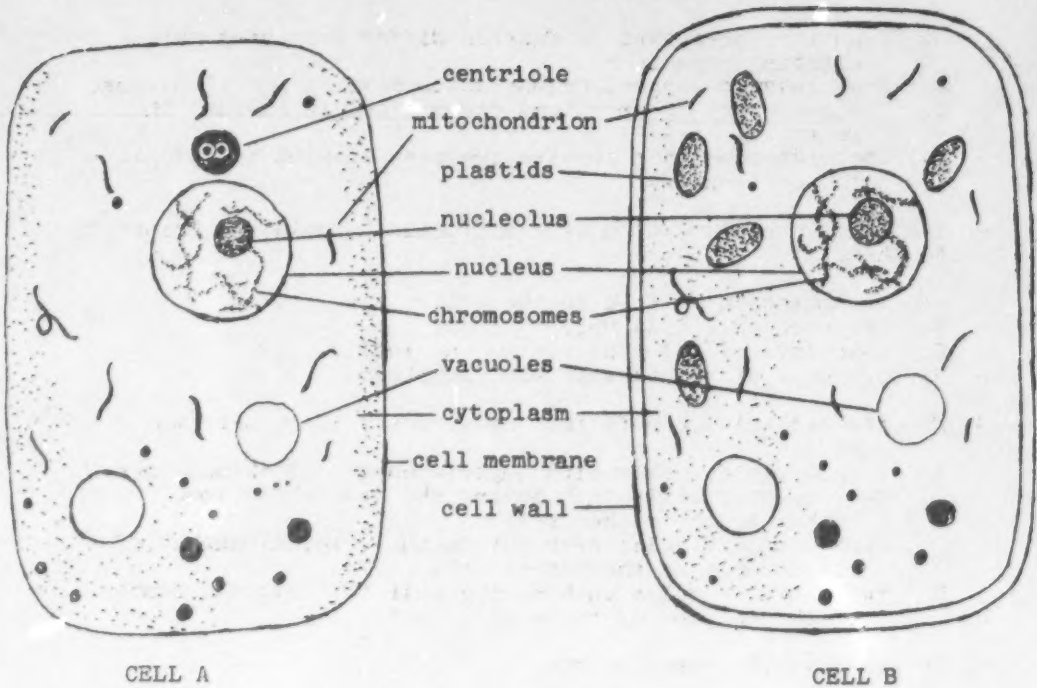
15. Which of the following pairs of organisms can manufacture their own food?
 - A. I, IV
 - B. II, III
 - C. IV, VI
 - D. I, V
16. Which of the following pairs of organisms possess a backbone?
 - A. IV, VII
 - B. V, III
 - C. IV, VI
 - D. I, II
17. Organisms I, II and III belong to a big group known as
 - A. Animal Kingdom
 - B. Plant Kingdom
 - C. Protist Kingdom
 - D. Phylum Tracheophyta
18. Which statement does not characterize a dicot plant?
 - A. generally netted leaf venation
 - B. with two cotyledons
 - C. vascular bundles arranged in a ring encircling the pith
 - D. grows from 1 m to 2 m tall only
19. What is the largest group in which a living organism could be placed in?
 - A. Kingdom
 - B. Phylum
 - C. Family
 - D. Genus
20. Living things are classified into groups. Two groups which when taken together will include every living things are
 - A. Vertebrates and invertebrates
 - B. Plants and animals
 - C. Mammalian animals
 - D. Protists and viruses

21. The scientific name of corn is Zea mays Linn. Which of the following is correct concerning the way this name is written?
- A. The Linn. means that a particular name is from the Latin language.
 - B. The Linn. means that the Swedish botanist, Linneaus, gave this plant its scientific name.
 - C. The three names should be capitalized.
 - D. The Linn. has nothing to do with the name of the plant.
22. A taxonomist found a gumamela plant in a remote place. He described it as a new species. The characteristic most suitable to distinguish it from other species is the
- A. leaf size
 - B. plant size
 - C. type of soil where it grows
 - D. structure of flowers
23. Alicia saw a slow-moving organism under the microscope. She would like to study the detailed structure of the organism. What part of the microscope should she move?
- A. Low power objective and fine adjustment knob.
 - B. High power objective and coarse adjustments knob.
 - C. Low power objective and coarse adjustment knob.
 - D. High power objective and fine adjustment knob.
24. How does a biologist view the modern method of classification?
- A. The method of classification has been established since 1753 by Carl von Linne, hence it should not be changed.
 - B. It is an artificially man-made system of grouping and naming organisms based on structures used by biologists in order to conveniently handle information about living organisms.
 - C. Before an organism appears on earth there is already a scheme of classification for it.
 - D. This system of classification eliminates other organisms from the group based on their habitat.
25. A species is a group of similar organisms that
- A. live in the same geographic locations
 - B. eat the same kind of food
 - C. can mate and produce fertile offspring
 - D. can easily disappear.
26. Which of the following is a commonly used taxonomic criterion in fossil mammals?
- A. Heart
 - B. Teeth and skull
 - C. Blood corpuscles
 - D. External ear

27. On an expedition a paleontologist found a fossilized snail on a rock. It had a maximum diameter of 6 cm and a maximum length of 8 cm. In a nearby area at a depth of 150 ft. he found another fossilized snail. It was similar to the first one in all respects except that the maximum diameter is 2 cm and the maximum length is 3 cm. The paleontologist hypothesized that the bigger snail lived earlier than the smaller snail. Of the following statements, the best way to test this hypothesis would be to
- A. search the rock layers in which the snail fossils were found for fossils of other organisms whose relative ages were known.
 - B. measure the thickness of the two rock layers in which the fossils were found.
 - C. examine the texture of the rocks where fossils were found.
 - D. determine the color of the rocks where the fossils were found.
28. In 1900 there were 100 deers that used to live in the mountains of Isabela. Constant hunting and killing by men and other wild animals have caused a decrease in the population of the deer after 10 years. At present there are no more deer observed in this place. The deer is said to be
- A. an adapted animal
 - B. a perpetuated species
 - C. an extinct animal
 - D. a migratory species
29. Which of the following best describes organic evolution?
- A. Evolution is the development of an organism from the primitive form to the present form after a period of time under changing environmental conditions.
 - B. Evolution is variation that occurs in every generation of the organism.
 - C. Evolution is a proof that man is the superior animal.
 - D. Evolution is change in the environment.
30. During the Miocene period there was an increase in the number of species of grazing mammals. One reason for this is the
- A. widespread formation of grasslands
 - B. abundance of insects
 - C. complete absence of amphibians and reptiles
 - D. appearance of the Archeopteryx
31. The monkey-eating eagle and the tamaraw had a common cause of extinction which is the
- A. destruction of forests where these animals breed and live
 - B. inability of these animals to produce alive offspring
 - C. slow rate of reproduction
 - D. electrification of many cities and towns
32. The characteristics defining a genus are more general than those defining
- A. a family
 - B. a species
 - C. a class
 - D. a phylum

33. After studying a variety of scientific writings the biologist would be correct in deciding that all the following statements serve as evidence in support of the theory of evolution by natural selection except:
- A. Organisms preserved as fossils differ from presently existing organisms.
 - B. Some animals possess organs which have no useful purpose.
 - C. The structure of organisms did not change through the years.
 - D. The organisms that survive are best adapted to live in the environment.
34. The rigid structure of most plant cells is mainly attributed to the
- A. accumulation of food in the cell walls
 - B. presence of a cell wall
 - C. abundance of chloroplasts in the leaf cells
 - D. presence of vacuoles in the cytoplasm.
35. Mitotic cell division in the onion root cell results to
- A. four daughter cells with haploid number of chromosomes.
 - B. two daughter cells each having the same chromosome number as the mother cell
 - C. four daughter cells each having the original number of chromosomes as the mother cell
 - D. two daughter cells each having half the original number of chromosomes as the mother cell.
36. In man meiosis occurs in the
- A. egg cell of the female and sperm cell of the male, separately
 - B. egg cell of the female only
 - C. sperm cell only
 - D. egg cell of the female whenever fertilization occurs
37. The basic source of energy for all life on earth is
- A. the sun
 - B. water and carbon dioxide
 - C. oxygen in the atmosphere
 - D. minerals in the soil
38. Which of the following statements about the cells of a tree is true?
- A. All its cells photosynthesize all the time.
 - B. All its cells photosynthesize some of the time.
 - C. Some of its cells photosynthesize.
 - D. Some of its cells never photosynthesize all the time.

Items 39-41 refer to the drawings of the cell below:



39. Study closely cell A and cell B. Identify which of the two cells is an animal cell.

- A. cell A
- B. cell B
- C. part of cell A and part of cell B
- D. neither of cell A and cell B

Items 40-41: From the statements below choose two characteristics that distinguish cell A from cell B.

- A. The presence of plastids and a thicker cell wall in cell B.
- B. The presence of centrioles in cell A.
- C. The position of the nucleus in cell B.
- D. The number of the mitochondrion in cell A.

Questions 42-46. For each of the following, choose the letter that describes the item in numbers 42-46.

- A. if it is a raw material in photosynthesis.
- B. if it is a product of photosynthesis.
- C. if it is a catalyst in photosynthesis.
- D. if it is required in photosynthesis but not as a raw material.

42. Light energy

- 43. Water
- 44. Oxygen
- 45. Carbon dioxide
- 46. Chlorophyll

Items 47-50. Below is a Punnet square which represents possible inheritance in dihybrid crosses where black (B) is dominant to white (b) and straight hair (S) is dominant to curly hair (s). The organisms are represented by a letter inside the box.

	BS	Bs	bS	bs
BS	A	C	E	G
Bs	I	K	M	O
bS	Q	R	T	U
bs	V	W	X	Y

47. The genotype of organism C is

- A. BBSS
- B. BBSS
- C. BbSS
- D. bbSS

48. The phenotype of organism U is

- A. black, straight hair
- B. black, curly hair
- C. white, straight hair
- D. just like organism G.

49. Which organism will show both recessive traits?

- A. Organism O
- B. Organism Y
- C. Organism U
- D. Organism A

50. Which organism will be white and homozygous for straight hair?

- A. Organism E
- B. Organism M
- C. Organism X
- D. Organism T

INTEGRATED SCIENCE TEST

Please accomplish this test in 60 minutes. Write your answers on separate answer sheets. Do not write anything on this booklet. When you have completed answering each item, return this booklet with your response sheets. Be sure to write your name on all your answer sheets.

This test consists of two parts. Each part has a separate set of instructions. Read the instructions for each part carefully and thoroughly before answering the test questions.

For Part I, on your answer sheets, write the number of the one best answer.

Now open the booklet.

Part I

The items in this part of the test are either statements or problems which call for answers. Read each item carefully and work mentally on your problem (or compute on a scratch paper). Then read carefully the four suggested answers marked 1, 2, 3, 4. Decide which number is the best answer and record this number on the appropriate place on your ANSWER SHEET by blackening the space between two vertical lines under the number you have selected.

Example Test 0. Which of the following is the best definition of density?

Density of a substance is

1. weight per unit volume of the substance.
2. volume per unit weight of the substance.
3. mass per unit volume of the substance.
4. volume per unit mass of the substance.

The answer is the phrase numbered 3 among the suggested answers. Observe how number 3 was blackened.

	(1)	(2)	(3)	(4)
0)			■	

If you wish to change your first answer for another, erase carefully your first answer and blacken another set of vertical lines. Do not make unnecessary marks.

1. Using an inclined plane, Jose raised a load of 10 newtons to a height of 5 meters by pushing the load with a force of 5 newtons through a distance of 12 meters along the plane. The output of the system is
 1. 5 m x 10 newtons
 2. 5 m x 5 newtons
 3. 12 m x 5 newtons
 4. 12 m x 10 newtons
2. In which of the following situations is the most work done?
 1. Lifting a 10-newton rock to a height of 2 meters in 5 seconds.
 2. Lifting a 5-newton rock to a height of 4 meters in 3 seconds.
 3. Dragging a 8-newton rock up an inclined plane 2.5 meters high.
 4. Dragging a 7-newton rock up an inclined plane 3 meters high.
3. When work is done in a system the input energy is always greater than the output energy. This is so because
 1. part of the input energy is used to overcome friction.
 2. friction is always accompanied by heat.
 3. part of the input energy is absorbed by the system.
 4. output energy cannot be equal to the input energy.

Questions 4 and 5 refer to Figure 1 below:



Figure 1

4. In Figure 1 object B exerts a force as it falls down and raises object A up the inclined plane. To determine the output of the system multiply
 1. force A and distance C.
 2. force B and distance D.
 3. force A and distance D.
 4. force B and distance C.
5. In the system in Figure 1, which factors will determine the amount of potential energy of B?
 1. weight and height of B from the floor.
 2. weight of B and friction.
 3. weight of B and A.
 4. height of B from the floor and friction.
6. If a cart rolls down an inclined plane which of the following will happen?
 1. Potential energy of the cart decreases.
 2. Kinetic energy of the cart decreases.
 3. Potential energy of the cart increases.
 4. Kinetic energy of the cart remains the same.

The diagram below shows the water drop pattern formed as a cart moves from Position 1 to Position 2.

Position

Position

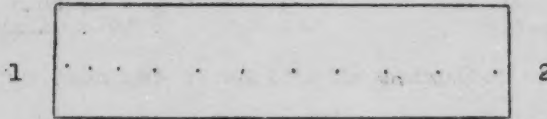


Figure 2

7. From this pattern you can say that the speed of the cart

1. is decreasing
2. is increasing
3. remains constant.
4. increases, then decreases.

Questions 8 and 9 refer to Figure 3.

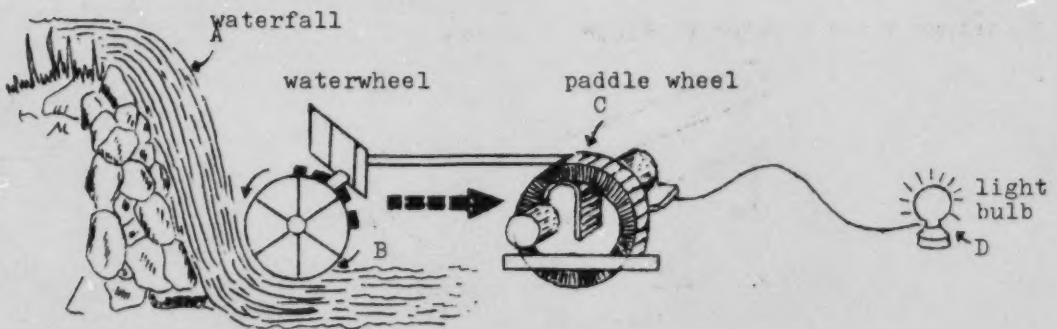


Figure 3

8. In the system shown in Figure 3 the change in the forms of energy is from

1. mechanical to electrical to heat.
2. gravitational to mechanical to electrical to heat.
3. gravitational to mechanical to electrical to light and heat.
4. mechanical to chemical to light and heat.

9. Which pairs of objects can be considered as sub-systems in the system shown in Figure 3?

- A. the waterfall and waterwheel
- B. the waterwheel and paddle wheel
- C. the paddle wheel and light bulb
- D. the waterfall and light bulb
- E. the waterwheel and light bulb

1. ABC
2. BCD

3. CDE
4. DEA

10. The thermometer measures

1. heat.
2. change in the amount of heat.
3. temperature.
4. energy lost in a system.

11. Thermometer works on the principle that

1. substances absorb heat.
2. substances expand when heated.
3. substances have different heat capacities.
4. substances differ in their ability to absorb heat.

12. Beakers A and B contain the same amount of water. The temperature of the water in A is 90°C while the water in B is 55°C. According to the energy-particle model for matter, we can say that the particles of water in beaker A are

1. moving slower than those in beaker B.
2. moving faster than those in beaker B.
3. smaller than those in beaker B.
4. larger than those in beaker B.

13. Suppose you heated 100 ml of water from 50°C to 70°C. To calculate the amount of heat that has been added to the water which operation below will you perform?
Heat added =

1. 70°C x 100 ml of water
2. (70°C - 50°C) x 100 ml of water
3. 70°C + 100 ml of water
4. (70°C - 50°C) + 100 ml of water

14. The "Heat-as-substance" model claims that heat is a substance being added to materials that are heated. This model is no longer accepted because it could not explain

1. the heat transfer from warm to cold objects.
2. why there is no increase in mass of objects when heated.
3. the expansion of materials when heated.
4. why heat is lost to the surroundings.

Questions 15, 16, and 17 refer to the situation below.

An experiment to find out if the amount of CO₂ produced by yeast is related to the amount of glucose was performed. The table below shows the materials used.

Tube Number	INGREDIENTS	Amount of Yeast
1	10 ml of glucose	5 g
2	5 ml of glucose and 5 ml of water	5 g
3	3 ml of glucose and 7 ml of water	5 g
4	1 ml of glucose and 9 ml of water	5 g
5	10 ml of water	5 g

15. Which tube serves as a control?

- | | |
|-----------|----------------------|
| 1. Tube 1 | 3. Tube 5 |
| 2. Tube 3 | 4. None of the above |

16. Which tube has the greatest concentration of glucose?

- | | |
|-----------|-----------|
| 1. Tube 1 | 3. Tube 3 |
| 2. Tube 2 | 4. Tube 5 |

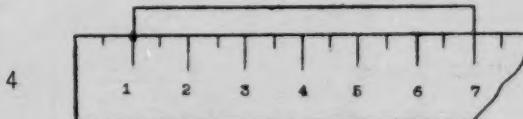
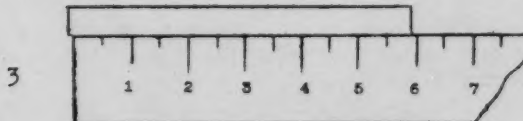
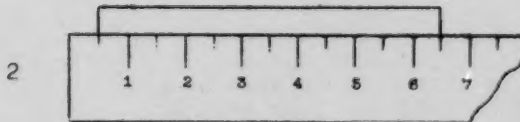
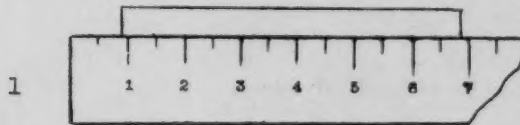
17. Which variable(s) is (are) controlled?

- | | |
|------------|----------------------|
| 1. glucose | 3. yeast |
| 2. water | 4. yeast and glucose |

18. Kinetic energy is possessed by

1. a rolling ball.
2. a hanging rock.
3. a ball resting on a table.
4. a big piece of rock on the ground.

19. The following diagrams show a portion of a ruler placed along a side of a rectangle whose side is to be measured. Which of the diagrams shows best how you would measure the length of the rectangles?



20. The length of the rectangle shown in item 19 is

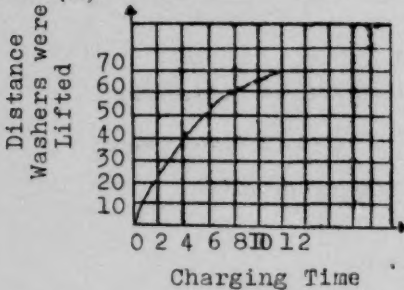
- | | |
|------------|------------|
| 1. 6 cm. | 3. 6.9 cm. |
| 2. 6.5 cm. | 4. 7 cm. |

21. The amount of work done on the object varies according to the force needed to move it and the distance through which it is moved. On this basis, the best operational definition of work is
 1. the motion of an object.
 2. exerting force through a measurable distance.
 3. the force of friction.
 4. the distance through which force is exerted.
22. A group of objects make up a system when they
 1. influence one another.
 2. are very close to each other.
 3. are connected by chains.
 4. are run by one motor.
23. What happens to the mass and weight of a bag of sugar when brought to the moon?
 1. The weight decreases while the mass increases.
 2. The weight increases while the mass decreases.
 3. The weight decreases while the mass remains the same.
 4. The weight remains the same while the mass decreases.
24. When a solid dissolves in a liquid, the total mass of the system
 1. increases.
 2. decreases
 3. remains the same.
 4. decreases then increases.
25. When two clear solutions are mixed and then a colored solid is produced, you know that
 1. a chemical reaction has occurred.
 2. heat is produced.
 3. atoms have been destroyed.
 4. atoms have been produced.
26. According to the model of matter developed in Integrated Science course, all matter is made up of
 1. substances composed of only one kind of atom.
 2. one or more of the 100 or so kinds of atoms.
 3. substances called compounds.
 4. thousands of different substances called elements.
27. A group of students charged a battery and used it to lift washers. They did this several times. The length of time the battery was charged and the height to which the washers were lifted in each trial is given in the following table:

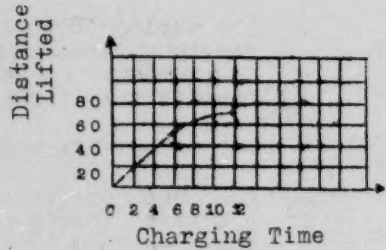
Trial	Charging Time	Distance washers were lifted
1	3 min	30 cm
2	5 min	45 cm
3	8 min	60 cm
4	10 min	65 cm
5	12 min	70 cm

If the above data were graphed, which of the following graphs correctly expressed the data.

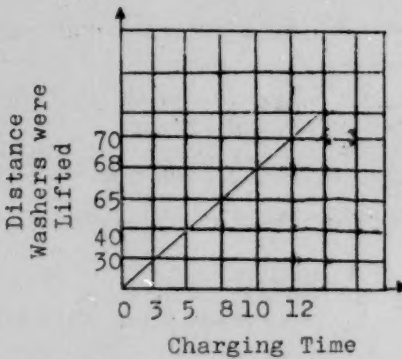
(1)



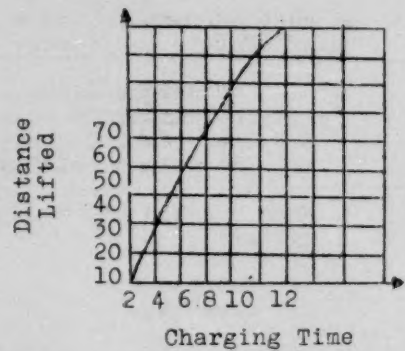
(2)



(3)



(4)



28. When some observations in a certain area of science cannot be explained by an existing scientific model, scientists may
1. completely discard the model.
 2. disregard the observations.
 3. modify the observations to suit the model.
 4. modify the model so it could explain the new observations.
29. Which of the following statements best characterizes a classroom atmosphere conducive to learning through inquiry.
1. Students are quietly seated at their own desks, listening to a lecture or watching a demonstration, and responding only when called upon.
 2. Students are all working at the same place using identical materials under the guidance of the teacher.
 3. Students respond to text-directed activities and related questions when encouraged by the teacher.
 4. Students are in constant activity, performing experiments picking up equipment and supplies needed, discussing results with classmates, making records and consulting the teacher.

30. Which of the following statements do not characterize a science course appropriate for the first two years of schooling beyond grade six?
1. Science instruction should develop children to become scientists.
 2. The processes and concepts of science should be presented to students simultaneously.
 3. Curriculum materials should be activity centered.
 4. Curriculum materials should be designed to allow the rate of instruction and the scope and sequence of content to vary with the individual student's background, interest and ability.

Part II

Complete each of the following tasks to the best of your ability. Write your answers to each task on the blank answer sheets. Be sure to number your answers accordingly.

- 31-36. State at least six features which would characterize a science classroom where self-pacing, activity centered approach is being used.
37. Why is storage and display of equipment so important to a self-pacing, activity centered science program?
- 38-41. State at least four reasons why students should share responsibility for equipment management with the teacher.
42. Read the following descriptions of the evaluation practices of certain teachers. On your answer sheet write the letter of each item in which feedback factors match the self-pacing goal of individualized learning.
- a. Miss A believes that additional (enrichment) activities are one of the most valuable parts of a science program. She, therefore, requires that all students do at least three fourths of the additional activities, and she evaluates students on their progress toward completing them.
 - b. Mr. R employs self-pacing in his biology class. He gives a test once a month. This test includes the material he feels the average student who tries should be able to cover in that length of time.
 - c. Mrs. T employs self-pacing in her algebra class. When a student finishes a chapter, he is evaluated on the performance objectives which she had made available to the students before they began the chapter.

43-45. What three conditions must a behavioral objective fulfill?

For each of the following questions, select one of the three choices and write the appropriate letter opposite the corresponding number on your answer sheet.

- A - the teacher
- B - the student
- C - both the teacher and the student

When implementing a science course characterized by a self-pacing, activity centered approach,

- 46. Who should determine the initial plan for the organization of equipment and materials in the classroom?
- 47. Who should be involved in implementing and revising the initial organizational plan?
- 48. Who should have the responsibility of making the assignments regarding equipment management?
- 49. Who should have the responsibility of establishing traffic patterns and of locating supply centers in the room?
- 50. Who should be responsible for deciding the equipment and materials that will be needed for student activities and for making them available prior to their need?
- 51. Who should be responsible for selecting the equipment and materials from supply centers when they are needed for student activities?
- 52. Who is responsible for cleaning up student work areas and equipment?
- 53. Who should be responsible for the care of text materials?
- 54. Who is responsible for arranging to have all locally supplied materials available when they are needed?
- 55. Who should have the responsibility of the daily inventory of equipment and materials following each class?
- 56. Who is responsible for the security of easily lost, easily stolen, or potentially dangerous items?
- 57. Who should have the responsibility of equipment maintenance and repair?
- 58. Who should be involved in setting up an equipment made up of several items.
- 59. Who has the major responsibility of safety in the science room?
- 60. Who should have the responsibility of the safe collection, storage and disposal of potentially harmful chemical wastes?

GEOMETRY TEST

Directions:

This is a test to determine your acquisition of cognitive skills and processes as applied to geometric concepts and principles. The specific cognitive skill process and the geometric concept and/or principle is indicated on the left of each question.

There are 30 questions for you to answer in one hour. Write the letter corresponding to the best answer in a separate answer sheet.

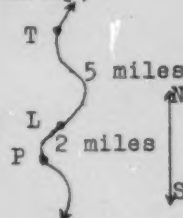
DO NOT WRITE anything on the test booklet.

Form A-2 (Geometry)

Constructing
conceptual
models

Points, Lines
& Planes

1. In the figure on the right there are three towns on the road. There is another town on this road whose distance from T and from P are the same. Where is it?
 - a. between T and L
 - b. between L and P
 - c. north of T
 - d. south of P



Constructing
conceptual
models

Circles and
their arcs

2. We know that a circle is the set of all points on a plane that are at a given distance from a certain fixed point. Which of the following models are most suitable for a circle?
 - a. cut from cartolina
 - b. made of plywood
 - c. made of wire
 - d. all of the above.

Constructing
conceptual
models

Coordinate
geometry

3. The slope of $\overline{AB}$ = slope of $\overline{CD}$. Then
 - a. $\overline{AB} \parallel \overline{CD}$
 - b. $\overline{AB} \perp \overline{CD}$
 - c. $\overline{AB} = \overline{CD}$
 - d. none of these

Making
inferences

Points, Lines
& Planes

4. L, M, and T are three distinct points
 $|LM| + |TM| = |TL|$
 Then
 - a. M is between L and T
 - b. M, L, and T are not collinear
 - c. L is between M and T
 - d. T is between L and M

Making
inferences

Angles and
angular
measures

5. If two angles are both congruent and supplementary they are
 - a. acute angles
 - b. right angles
 - c. obtuse angles
 - d. reflex angles

Making
inferences

Triangles

6. The angles of a triangle are in the ratio 2:3:4. The measure of the largest angle is
 - a. 20°
 - b. 40°
 - c. 60°
 - d. 80°

Making
inferences

7. The altitude to the base of an isosceles triangle divides it into two triangles which are

- a. both congruent and right
- b. right but not congruent
- c. congruent but not right
- d. neither congruent nor right.

Triangles

Making
inferences

8. Given the statements,

If a triangle is congruent to $\triangle ABC$ then
it is not equilateral.
 $\triangle GHI$ is equilateral.

Which of these statements follow?

Congruence

- a. $\triangle GHI$ is not congruent to $\triangle ABC$
- b. $\triangle GHI$ is congruent to $\triangle ABC$
- c. All equilateral triangles are $\cong$ to $\triangle ABC$
- d. No valid conclusion can be made.

Making
inferences

9. Which of the following is a set of similar figures?

- a. all equilateral triangles
- b. all isosceles triangles
- c. all right triangles
- d. all rectangles.

Similarity

Making
inferences

10. Which of the following triples cannot be the measures of the sides of a triangle.

- a. 1, 1, $\sqrt{2}$
- b. 2, 2, 2
- c. 1, 2, 3
- d. 3, 4, 5

Inequalities

Making
inferences

11. The sides of a rectangle measure 3 cm. and 4 cm. The measure of its diagonal is

- a. 5 cm
- b. 7 cm
- c. 12 cm
- d. cannot be determined.

Pythagorean
theorem
(parallelism)

Making
inferences

12. ABCD is a rectangle. Therefore

- a. $\overline{AC} = \overline{BD}$
- b. $\overline{AC} \perp \overline{BD}$
- c. $\overline{AC}$ and $\overline{BD}$ bisect each other
- d. all of the above are true.

Quadri-
laterals

Making
inferences

13. ABCD is a parallelogram. Then

- $\overline{AC}$ and $\overline{BD}$ bisect each other
- $\overline{AC} \perp \overline{BD}$
- $\overline{AC} = \overline{BC}$
- $\overline{AC} = \overline{AB}$

Quadri-
laterals

Making
inferences

14. The endpoints of two diameters of a circle are the vertices of a

- parallelogram
- rectangle
- rhombus
- square

Circles and
their arcs

Constructing
conceptual
models and
making
inferences

15. $\angle BAC$ is inscribed in circle O. Which of the following is true?

- $\overline{BC}$ is a diameter of circle O
- $\angle BAC$ is a right angle.

Circles and
their arcs

- 1 only
- 2 only
- both 1 and 2
- neither 1 nor 2

Organizing
data and
making
inferences

16. $\overline{AB}$, $\overline{AC}$, $\overline{AD}$, $\overline{AE}$, and $\overline{AF}$ are line segments.
 $\overline{AB}$ is shorter than $\overline{AD}$
 $\overline{AE}$ is congruent to $\overline{AD}$
 $\overline{AF}$ is longer than $\overline{AE}$ but shorter than $\overline{AC}$
Which line is the longest?

Points, lines
& planes

- $\overline{AF}$
- $\overline{AD}$
- $\overline{AC}$
- $\overline{AE}$

Constructing
conceptual
models and
making
inferences

17. $\overline{CD}$ is the median of right $\triangle ABC$ with right angle at C. Then

- $\overline{CD} = \overline{AD}$
- $\overline{CD} = \overline{AC}$
- $\overline{CD} = \overline{AB}$
- none of these

Congruence

Organizing
data and
constructing
conceptual
models

18. l , m and n are three different lines on the same plane. If $l \perp m$ and $m \parallel n$ then

- $l \perp n$
- $l \parallel n$
- $m \perp n$
- none of these.

Parallelism

Organizing
data and
making
inferences

19. $\overline{AD}$ is the diameter of a circle. A, B, C, and D are successive points on the circle. Which of the following statements are true?

- a. $\overline{AC} > \overline{AB}$
- b. $\overline{AC} < \overline{AB}$
- c. $\overline{AC} = \overline{AB}$
- d. $\overline{AC} = \overline{AD}$

Circles and
their arcs

Constructing
conceptual
models,
organizing
data and
making
inferences

20. The sides of a trapezoid are all chords of a circle. Which of the following statements are true?

- I. The base angles of the trapezoid are congruent.
- II. The trapezoid is isosceles.

Circles and
their arcs

- a. I only
- b. II only
- c. both I and II
- d. neither I nor II

Making
precise
mathematical
statements

21. Which of the following statements have exactly the same meaning as the statement:

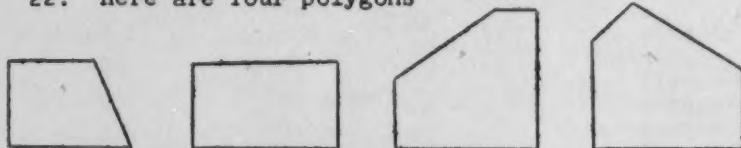
All isosceles right triangles are similar.

- a. If two triangles are similar then they are isosceles right triangles
- b. If two right triangles are also isosceles then they are similar.
- c. If two right triangles are similar then they are isosceles triangles
- d. If two isosceles triangles are similar then they are right triangles.

Triangles

Making
precise
mathematical
statements

22. Here are four polygons



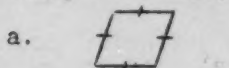
Which of the following statements describe the number of right angles?

- a. They have exactly two right angles.
- b. They have at least two right angles.
- c. They have at most two right angles.
- d. They have more than two right angles.

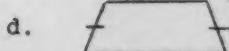
Polygons

Disproving
invalid
statements

23. Your classmates say, "The square is the only quadrilateral whose sides are all congruent to each other". Which of the following is an example to show that what he said is not true?



Quadrilaterals



Making
predictions

24. Two lines never meet. Then which of the following is possible?

1. The lines are parallel.
2. The lines are not on the same plane.

Parallelism

- a. 1 only
- b. 2 only
- c. both of them
- d. neither of them

Making
predictions

25. Study the relationship between the number of sides of a polygon and the number of diagonals through one vertex.

	Number of sides	Diagonal through A
A	3	0
A	4	1
A	5	2

If a figure has 20 sides, how many diagonals will there be through A?

- a. 10
- b. 19
- c. 17
- d. none of these

- Constructing deductive lines of reasoning 26. The terms:
1. angle
 2. betweenness
 3. ray
- are to be defined. Which of the following is the logical sequence of their definitions?
- Points, lines and planes a. 1, 2, 3
 b. 1, 3, 2
 c. 2, 1, 3
 d. 2, 3, 1
- Constructing deductive lines of reasoning 27. Which of the following is needed in the proof of The sum of the measures of the angles of a triangle is 180° .
- a. Vertical angles are congruent
 - b. Supplements of congruent angles are congruent.
 - c. The exterior angle of a triangle is greater than either of the angles not adjacent to it.
 - d. The alternate-interior angles made by the transversal of parallel lines are congruent.
- Parallelism
- Thinking functionally 28. $\angle B$ is twice its complement. What happens to the measure of its complement if the measure of $\angle B$ is increased by 10° ?
- a. increased by 10°
 - b. decreased by 10°
 - c. increased by 20°
 - d. decreased by 20°
- Angles and angular measures
- Thinking functionally 29. If a side of a square is doubled its area is
- a. doubled
 - b. multiplied by 4
 - c. multiplied by 8
 - d. multiplied by 16
- Quadrilaterals
- Thinking functionally 30. The radius of a circle is doubled. What is the ratio of the new circumference to the new diameter?
- a. 1 : 2
 - b. 2 : 1
 - c. 1 : 4
 - d. none of these
- Circles

Observation and Interview Sheet

Name of Observer: _____ Date: _____
 Teacher: _____
 School: _____
 Subject: _____

Evaluation: Represents the best judgement of the observer after all evidence has been considered.

Use the following codes:

- 4 = Provision or condition prevails extensively
- 3 = Provision or condition prevails moderately
- 2 = Provision or condition is very limited
- 1 = Provision or condition is missing but needed
- NA = Provision or condition is not applicable

Write additional comments in space provided.

A. Rooms

- _____ a. Adequate in size for class
- _____ b. Not disturbed by other activities outside
- _____ c. Can be used as a laboratory room
- _____ d. Properly lighted
- _____ e. Good ventilation
- _____ f. Sufficient water supply
- _____ g. Sufficient tables for performing experiments
- _____ h. Presence of electrical outlets

Comments: _____

B. Students

- _____ a. Evidences for availability of written materials to them
- _____ b. Were able to perform basic experiments
- _____ c. Show interest and direct involvement in class
- _____ d. Show cooperative effort
- _____ e. Enjoy their science class
- _____ f. Evidence for doing homework

Comments: _____

C. Teacher

- _____ a. Evidences that demonstration experiments were performed
- _____ b. Self-confident
- _____ c. Involves every student in class activities
- _____ d. Evidences for implementing UP-SEC course
- _____ e. Competence in subject matter
- _____ f. Evidences for adequately prepared for lessons
- _____ g. Has rapport with students
- _____ h. Innovative
- _____ i. Emphasizes analytical rather than rote learning

Problems of Teachers: _____

Other comments on Teacher: _____

D. General

- a. Laboratory equipment are adequate for the science course.
- b. Evidences that funds are provided for science classes.
- c. Evidences that administrators have been cooperative with teachers
- d. Evidence of benefits derived by school in sending teacher to RSTC

Comments: _____

Reminder: Have a course outline and list of experiments and demonstrations.

Other General Comments:

TEACHER
PERSONAL DATA

1. Name of Teacher: _____
(Family) (First) (Middle)
2. Sex: _____ Male _____ Female
3. Age: _____ Years
4. Name of school where you are presently teaching: _____

5. Address of school: _____
6. Classification of school: _____ Public _____ Private
7. Approximate total enrollment (from 1st to 4th year) of your school: _____ students
8. Average number of students per section in the subject(s) you presently teach. _____ students
9. School/college/university where you graduated

College or University	Degree	Major	Minor	Year of Graduation
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
10. What Regional Science Teaching Center and what subject area are you now attending? Please check one under each column.

<u>Center</u>	<u>Subject</u>
_____ Aquinas University	_____ Physics
_____ Ateneo de Davao	_____ Chemistry
_____ Notre Dame of Marbel	_____ Biology
_____ Silliman University	_____ Gen. Science
_____ St. Louis University	_____ Mathematics
11. How many years have you been teaching the subject you are now attending at the RSTC?
_____ years
12. Please list the subjects you have taught in the past and the number of years you taught them.

Subject

Number of years you taught
the subject

13. In your teaching, have you previously used the U.P. Science Education Center Text for your area of specialization?
(Please check one)

☐ Yes ☐ as the main text
☐ ☐ as a supplementary textbook
☐ No ☐ as a reference book only

14. Besides your teaching duties, which of the following functions have you done in the past? Please check those that you have performed.

Function

☐ Conducted Echo Seminar
☐ Gave demonstration lessons
☐ Acted as resource person or seminar speaker
☐ Attended seminar/workshop in your area of specialization
☐ Coordinated activities of teacher in the area of specialization
☐ Prepared teaching materials (e.g. syllabi, manuals, teaching aids)
☐ Constructed simple devices for laboratory experiments

15. Check the item or items which you think were considered in your being selected to participate in the Summer Institute.

☐ a. Academic qualification
☐ b. Teaching efficiency
☐ c. Reward for outstanding work
☐ d. Personal interest in the subject area
☐ e. Recommendation of supervisor or principal
☐ f. To fill the need for a trained personnel
☐ g. You personally applied
☐ h. Others (please specify) _____

16. Which three of the above items do you think were most important in your selection to participate in the institute. Rank them by indicating only the letters of the items.

(1st) (2nd) (3rd)

17. Prior to your selection (or nomination) for the Summer Institute, what or who was your source of information regarding the training program?

☐ Regional Science Teaching Center publication/announcement
☐ Mass media (radio, newspaper, television)
☐ Division of Schools memos and bulletins
☐ Immediate superior (supervisor or principal)
☐ Co-teacher
☐ Others (please specify) _____

Science Training Inventory

Below is a list of statements which we want you to react to. They are about the training you received in the content, methodology and philosophy of UPSEC curriculum materials, and the possible effects it had on you as a teacher. Before giving your answers, please try to compare your way of teaching before and after you attended the summer training institute. Also try to reflect on the possible effects that the training had on you as a science teacher.

Strongly	1	2	3	4	5	6	7	Strongly
Disagree								Agree

For each statement, circle a number which most closely resembles your feeling toward the statement. If you strongly agree with the statement, circle 7; if you strongly disagree with the statement, circle 1. If your feelings fall in between the two extremes, circle a number between 1 and 7. Place your responses on the accompanying answer sheet. Please return to us the answer sheet in the enclosed stamped and addressed envelope.

1. The training did not make me a better teacher.
2. My understanding of the subject significantly improved as a result of the training.
3. We received superior instruction in the laboratory aspects of the course.
4. Better emphasis should have been given to laboratory techniques and procedures.
5. Most of the topics we took up in the sessions were useful in my teaching now.
6. More emphasis should have been given to a deeper understanding of the basic concepts of the subject.
7. I wish there were more lessons on the techniques and methods of teaching.
8. The laboratories had adequate facilities for our needs.
9. As a result of the training we had on evaluation techniques, I am now better able to assess student performance.
10. I wish we had more lessons on test construction and evaluation of student performance.
11. My knowledge and understanding of science has considerably improved as a result of the RSTC Summer Institute Training.
12. I feel that my training at the RSTC has made me a better science teacher.
13. The subject matter in our RSTC training is generally relevant to my teaching high school science now.

14. The RSTC training has made me more familiar with the use of science apparatus and laboratory techniques.
15. I am able to use relatively inexpensive and locally available materials for experiments.
16. The RSTC training has provided me with useful techniques for my teaching now.
17. As a result of the RSTC training, my teaching is now geared more toward developing higher intellectual skills of the student.

Science Training Inventory Answer Sheet

Encircle the number corresponding to your answer.

1.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
2.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
3.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
4.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
5.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
6.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
7.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
8.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
9.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
10.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
11.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
12.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
13.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
14.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
15.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
16.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
17.

1	2	3	4	5	6	7
---	---	---	---	---	---	---

For Physics and Chemistry teachers only:

18. Do you think that one summer session (6 weeks) is sufficient to be updated with/oriented to the high school course that you are teaching? Please check one.
- Yes ☐ _____
- No ☐ _____
- Uncertain ☐ _____

For Biology, Math, and Gen. Science teachers only:

19. Do you recommend 2 sequential summers to be oriented to the high school course that you are teaching? Please check one.
- Yes ☐ _____
- No ☐ _____
- Uncertain ☐ _____

Science Training Inventory Answer Sheet

Encircle the number corresponding to your answer.

1.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
2.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
3.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
4.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
5.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
6.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
7.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
8.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
9.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
10.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
11.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
12.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
13.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
14.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
15.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
16.

1	2	3	4	5	6	7
---	---	---	---	---	---	---
17.

1	2	3	4	5	6	7
---	---	---	---	---	---	---

For Physics and Chemistry teachers only:

18. Do you think that one summer session (6 weeks) is sufficient to be updated with/oriented to the high school course that you are teaching? Please check one.
- Yes ☐ _____
- No ☐ _____
- Uncertain ☐ _____

For Biology, Math, and Gen. Science teachers only:

19. Do you recommend 2 sequential summers to be oriented to the high school course that you are teaching? Please check one.
- Yes ☐ _____
- No ☐ _____
- Uncertain ☐ _____

20. Do you think that even teachers who have undergone RSTC Training for your subject still need the Teacher's Guide when they go back to teaching? Please check one

Yes _____
No _____
Uncertain _____

20. Do you think that even teachers who have undergone RSTC Training for your subject still need the Teacher's Guide when they go back to teaching? Please check one.

Yes _____
No _____
Uncertain _____

Needs of Science Teachers - Part II

Listed below are specific topics and laboratory skills in Physics. Do you need to be updated or trained on these topics or skills? To help you answer the question, the following scale is provided.

Not at All 1 2 3 4 5 6 7 Very Much

Very much and Not At All are the apposite extremes of the scale. Number 7 represents Very Much, while number 1 stands for Not At All. Number 4 marks the neutral point. The scale is written opposite each item below. For each item, ENCIRCLE the number corresponding to your answer to the given question.

A. Do you need to be updated on the following topics?

1. Coulomb's force	1	2	3	4	5	6	7
2. Electric field and potential	1	2	3	4	5	6	7
3. Ohm's law	1	2	3	4	5	6	7
4. Resistors in Series and Parallel	1	2	3	4	5	6	7
5. Faraday's law	1	2	3	4	5	6	7
6. Lenz's law	1	2	3	4	5	6	7
7. Capacitance	1	2	3	4	5	6	7
8. Inductance	1	2	3	4	5	6	7
9. Maxwell's Equation	1	2	3	4	5	6	7
10. Magnetic field	1	2	3	4	5	6	7
11. Photoelectric effect	1	2	3	4	5	6	7
12. Quantum Theory	1	2	3	4	5	6	7
13. Wave particle duality of matter	1	2	3	4	5	6	7
14. Models of the atom	1	2	3	4	5	6	7
15. Models of the nucleus	1	2	3	4	5	6	7
16. Nuclear fusion and fission	1	2	3	4	5	6	7
17. Radioactivity	1	2	3	4	5	6	7
18. Biophysics	1	2	3	4	5	6	7
19. Elementary particles	1	2	3	4	5	6	7
20. Transistors	1	2	3	4	5	6	7

B. Have you felt the need to know the following laboratory skills.

1. to use optical bench	1	2	3	4	5	6	7
2. to use soldering iron or gun	1	2	3	4	5	6	7
3. to use diffraction grating and prism	1	2	3	4	5	6	7
4. to use telescope	1	2	3	4	5	6	7
5. to use oscilloscope	1	2	3	4	5	6	7
6. to use cathode ray tube	1	2	3	4	5	6	7
7. to use power supply (AC & DC)	1	2	3	4	5	6	7
8. to use galvanometer	1	2	3	4	5	6	7
9. to use voltmeter	1	2	3	4	5	6	7
10. to use ammeter	1	2	3	4	5	6	7
11. to use rheostat	1	2	3	4	5	6	7
12. to use force tables	1	2	3	4	5	6	7
13. to use caliper							
a. micrometer	1	2	3	4	5	6	7
b. vernier	1	2	3	4	5	6	7
14. to connect and maintain gas cylinders	1	2	3	4	5	6	7
15. to cut, shape and polish glass rods and tubings	1	2	3	4	5	6	7
16. to safely handle radioisotopes	1	2	3	4	5	6	7

17. to weigh and measure chemicals accurately 1 2 3 4 5 6 7
 18. to use the following instruments
 - a. protractor 1 2 3 4 5 6 7
 - b. drawing compass 1 2 3 4 5 6 7
 19. to use scientific notation and significant digits in recording measurements 1 2 3 4 5 6 7
 20. Perform the following computational skills
 - a. convert from one unit to another 1 2 3 4 5 6 7
 - b. compute with measures recorded in scientific notation with consideration for significant digits 1 2 3 4 5 6 7
 21. Translate from one form to another (words, symbols) statements regarding
 - a. ratio and proportion 1 2 3 4 5 6 7
 - b. direct and inverse proportion 1 2 3 4 5 6 7
 - c. direct square proportion and inverse square proportion 1 2 3 4 5 6 7
 - d. probability 1 2 3 4 5 6 7
 22. to construct the following
 - a. drawings of 2 or 3-dimensional geometric figures 1 2 3 4 5 6 7
 - b. scale drawings of geometric figures 1 2 3 4 5 6 7
 - c. graphs of empirical data or of equations 1 2 3 4 5 6 7
 23. to perform the following interpretative skills
 - a. given a graph (cartesian) or two quantities, establish the relationship between these two quantities 1 2 3 4 5 6 7
 - b. draw inferences from a semi-logarithmic graph 1 2 3 4 5 6 7
 - c. draw inferences from equations of functional relationships 1 2 3 4 5 6 7
- C. 1. Which of the following areas should the summer institute focus on for it to be of greatest use to you? Rank the areas according to the degree of usefulness to you. Assign the same rank to areas which are equally useful to you.

AREA	RANK
Content	_____
Use of Laboratory Equipment/Instruments	_____
Laboratory Procedures and Techniques	_____
Construction of Simple Laboratory Devices	_____
Mathematical Skills	_____
Methods of Teaching	_____
Evaluation of Student Performance	_____
Philosophy of Science	_____

2. Considering that you have only six weeks of summer, we would like to know your expectations as participants in the summer institute. Please check only those which you think are important to you.

I expect to receive some training on

- ☐ content
- ☐ laboratory procedures and techniques
- ☐ improvising simple laboratory devices
- ☐ making teaching aids
- ☐ test construction and analysis
- ☐ methods of teaching
- ☐ philosophy of science
- ☐ others (specify) _____

I expect that the institute will have

- ☐ a planned program of activities
- ☐ competent instructors
- ☐ capable resource persons
- ☐ efficient administrative staff
- ☐ adequate laboratory facilities
- ☐ satisfactory library facilities
- ☐ appropriate teaching aids
- ☐ lecture demonstrations
- ☐ lecture hand-outs
- ☐ classroom interaction between teachers and participants and among participants
- ☐ tests and/or term papers required of participants
- ☐ at least one field trip
- ☐ socials and outings
- ☐ a committee for tours in and out of campus
- ☐ reasonable board and lodging fees
- ☐ stipends immediately released to participants
- ☐ others (specify) _____

Needs of Science Teachers - Part II

Listed below are specific topics and laboratory skills in Chemistry. Do you need to be updated or trained on these topics or skills? To help you answer the question, the following scale is provided.

Not at All 1 2 3 4 5 6 7 Very Much

Very Much and Not At All are the opposite extremes of the scale. Number 7 represents Very Much, while number 1 stands for Not At All. Number 4 marks the neutral point. The scale is written opposite each item below. For each item, ENCIRCLE the number corresponding to your answer to the given question.

A. Do you need to be updated on the following topics?

1. Behavior of Gases	1	2	3	4	5	6	7
2. Kinetic Molecular Theory	1	2	3	4	5	6	7
3. Laws of Chemical Change	1	2	3	4	5	6	7
4. Electron Configuration and Periodicity of Properties (Periodic Table)	1	2	3	4	5	6	7
5. Atomic and Molecular Bonds	1	2	3	4	5	6	7
6. Geometry of Molecules and Hybridization	1	2	3	4	5	6	7
7. Oxidation-Reduction Reactions	1	2	3	4	5	6	7
8. Energy changes in chemical reactions	1	2	3	4	5	6	7
9. The Mole							
10. Stoichiometry	1	2	3	4	5	6	7
11. Chemical Equilibrium	1	2	3	4	5	6	7
12. Nature and Properties of Solutions	1	2	3	4	5	6	7
13. Colloids	1	2	3	4	5	6	7
14. pH and Neutralization	1	2	3	4	5	6	7
15. Electrochemistry	1	2	3	4	5	6	7
16. Carbon Compounds	1	2	3	4	5	6	7

B. Have you felt the need to know the following laboratory skills?

1. to use alcohol and gas burner	1	2	3	4	5	6	7
2. to use calorimeter	1	2	3	4	5	6	7
3. to use balance	1	2	3	4	5	6	7
4. to use vacuum pump	1	2	3	4	5	6	7
5. to use soldering iron or gun	1	2	3	4	5	6	7
6. to use scaler and rate meters for radioactivity	1	2	3	4	5	6	7
7. to use microscope (light field illumination)	1	2	3	4	5	6	7
8. to use pH meter	1	2	3	4	5	6	7
9. to use centrifuge	1	2	3	4	5	6	7
10. to use photometer	1	2	3	4	5	6	7
11. to use spectrometer	1	2	3	4	5	6	7
12. to use spectrophotometer	1	2	3	4	5	6	7
13. to use voltmeter	1	2	3	4	5	6	7
14. to use ammeter	1	2	3	4	5	6	7
15. to use melting point apparatus	1	2	3	4	5	6	7
16. to use separatory funnel	1	2	3	4	5	6	7
17. to use aspirator	1	2	3	4	5	6	7
18. to use distillation unit	1	2	3	4	5	6	7
19. to use dessicator	1	2	3	4	5	6	7
20. to use pipette	1	2	3	4	5	6	7

- | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|
| 21. | to use burette | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22. | to use graduated cylinder | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23. | to use barometer | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24. | to use thermometer scales | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25. | to use and adjust manometer | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 26. | to prepare solutions | | | | | | | |
| | a. percent | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | b. molar | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 27. | to use techniques involving chromatography | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28. | to connect and maintain gas cylinders | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 29. | to cut, shape and polish glass rods and tubings | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 30. | to grow crystals from prepared solutions | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 31. | to safely handle radioisotopes | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 32. | to weigh and measure chemicals accurately | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

- C. 1. Which of the following areas should the summer institute focus on for it to be of greatest use to you? Rank the areas according to the degree of usefulness to you. Assign the same rank to areas which are equally useful to you.

AREA	RANK
Content	_____
Use of Laboratory Equipment/Instruments	_____
Laboratory Procedures and Techniques	_____
Construction of Simple Laboratory Devices	_____
Mathematical Skills	_____
Methods of Teaching	_____
Evaluation of Student Performance	_____
Philosophy of Science	_____

2. Considering that you have only six weeks of summer, we would like to know your expectations as participants in the summer institute. Please check only those which you think are important to you.

I expect to receive some training on

- | | |
|-------|---------------------------------------|
| _____ | content |
| _____ | laboratory procedures and techniques |
| _____ | improvising simple laboratory devices |
| _____ | making teaching aids |
| _____ | test construction and analysis |
| _____ | methods of teaching |
| _____ | philosophy of science |
| _____ | others (specify) _____ |

I expect that the institute will have

- | | |
|-------|---------------------------------|
| _____ | a planned program of activities |
| _____ | competent instructors |
| _____ | capable resource persons |
| _____ | efficient administrative staff |
| _____ | adequate laboratory facilities |
| _____ | satisfactory library facilities |
| _____ | appropriate teaching aids |

____ lecture demonstrations
____ lecture hand-outs
____ classroom interaction between teacher
and participants and among participants
____ tests and/or term papers required of
participants
____ at least one field trip
____ socials and outings
____ a committee for tours in and out of campus
____ reasonable board and lodging fees
____ stipends immediately released to
participants
____ others (specify) _____

Needs of Science Teachers

Listed below are specific topics and laboratory skills in Biology. Do you need to be updated or trained on these topics or skills? To help you answer the question, the following scale is provided.

Not at All 1 2 3 4 5 6 7 Very much

Very much and Not at All are the opposite extremes of the scale. Number 7 represents Very Much, while number 1 stands for Not At All. Number 4 marks the neutral point. The scale is written opposite each item below. For each item, ENCIRCLE the number corresponding to your answer to the given question.

A. Do you need to be updated on the following topics?

- | | | | | | | | |
|--|---|---|---|---|---|---|---|
| 1. Interrelationships among plants, animals and environment | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. The Cell Theory | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. Nature of Living Organisms | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. Patterns of Inheritance | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. Multicellular Organization | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. The Diversity of Organisms | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. Photosynthesis | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. Cellular Respiration | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. Regulation of fluid in the Body of Plants and Animals | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. Transport of Materials within the body of living organisms | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. Modes of foodgetting and processing | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12. Gas Exchange between environment and organism | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13. Responses of living organisms | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14. Living things changed through time | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15. Plant and animal | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16. Energy transformation in a living system | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 17. Reproduction in plants and animals | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18. Adaptation for survival of species | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 19. The origin of life | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 20. Animal behavior | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

B. Have you felt the need to know the following laboratory skills?

- | | | | | | | | |
|---------------------------------|---|---|---|---|---|---|---|
| 1. How to use | | | | | | | |
| a) microscope | | | | | | | |
| 1) dissecting | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2) compound | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3) stereoscopic | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4) light field microscope | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| b) autoclave or pressure cooker | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| c) alcohol and gas burner | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| d) ocular micrometer | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| e) hemacytometer | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| f) hand microtome | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| g) microtome - rotary, sliding | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| h) sphygmomanometer | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| i) kymograph | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| j) incubator | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| k) dissecting instruments | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| l) pH meter | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

2. How to prepare and use

a) solutions

- | | | | | | | | |
|---------------------|---|---|---|---|---|---|---|
| 1) percent solution | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2) serial dilutions | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

b) fixations, stains and indicators

- | | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

c) slides

- | | | | | | | | |
|---------------------|---|---|---|---|---|---|---|
| 1) permanent mounts | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2) temporary mounts | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

d) sterile culture media

- | | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

e) vital stains

- | | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

3. How to isolate, culture and use the following in laboratory studies

- | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|
| a) algae | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| b) bacteria | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| c) cells | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| d) <u>Drosophila</u> | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| e) <u>molds</u> | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| f) protozoa | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

4. How to care for live animals in the laboratory

- | | | | | | | | |
|------------------|---|---|---|---|---|---|---|
| a) amphibians | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| b) birds | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| c) small mammals | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| d) reptiles | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

5. How to set up and maintain

- | | | | | | | | |
|----------------|---|---|---|---|---|---|---|
| a) an aquarium | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| b) a terrarium | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

6. How to do the following:

- | | | | | | | | |
|--|---|---|---|---|---|---|---|
| a) grow bacteria and molds | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| b) determine number of bacteria present per unit of volume of solution | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| c) fix and stain tissues of plants and animals | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| d) embed specimens in paraffin | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| e) make sections of tissues | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| f) preserve plant specimens | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

7. To construct and/or interpret

- | | | | | | | | |
|-------------------|---|---|---|---|---|---|---|
| a) taxonomic keys | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-------------------|---|---|---|---|---|---|---|

- C. 1. Which of the following areas should the summer institute focus on for it to be of greatest use to you? Rank the areas according to the degree of usefulness to you. Assign the same rank to areas which are equally useful to you.

AREA	RANK
Content	_____
Use of Laboratory Equipment/Instruments	_____
Laboratory Procedures and Techniques	_____
Construction of Simple Laboratory Devices	_____
Mathematical Skills	_____
Methods of Teaching	_____
Evaluation of Student Performance	_____
Philosophy of Science	_____

2. Considering that you have only six weeks of summer, we would like to know your expectations as participants in the summer institute. Please check only those which you think are important to you.

I expect to receive some training on

- _____ content
- _____ laboratory procedures and techniques
- _____ improvising simple laboratory devices
- _____ making teaching aids
- _____ test construction and analysis
- _____ methods of teaching
- _____ philosophy of science
- _____ others (specify) _____

I expect that the institute will have

- _____ a planned program of activities
- _____ competent instructors
- _____ capable resource persons
- _____ efficient administrative staff
- _____ adequate laboratory facilities
- _____ satisfactory library facilities
- _____ appropriate teaching aids
- _____ lecture demonstrations
- _____ lecture hand-outs
- _____ classroom interaction between teacher and participants and among participants
- _____ tests and/or term papers required of participants
- _____ at least one field trip
- _____ socials and outings
- _____ a committee for tours in and out of campus
- _____ reasonable board and lodging fees
- _____ stipends immediately released to participants
- _____ others (specify) _____

Needs of Science Teachers

Listed below are specific topics and laboratory skills in General Science. Do you need to be updated or trained on these topics or skills? To help you answer the question, the following scale is provided.

Not at all 1 2 3 4 5 6 7 Very much

Very much and Not at All are the opposite extremes of the scale. Number 7 represents Very Much, while number 1 stands for Not At All. Number 4 marks the neutral point. The scale is written opposite each item below. For each item, ENCIRCLE the number corresponding to your answer to the given question.

A. Do you need to be updated on the following topics?

1. Force, distance, work	1	2	3	4	5	6	7
2. Weight and mass	1	2	3	4	5	6	7
3. Force of friction	1	2	3	4	5	6	7
4. Forms of energy	1	2	3	4	5	6	7
5. Conservation of energy	1	2	3	4	5	6	7
6. Energy conversion	1	2	3	4	5	6	7
7. Particle model of matter	1	2	3	4	5	6	7
8. Atoms, molecules, elements, compounds	1	2	3	4	5	6	7
9. Electrical charges, ions	1	2	3	4	5	6	7
10. Kinetic molecular theory	1	2	3	4	5	6	7
11. Chemical Change	1	2	3	4	5	6	7
12. Convection currents	1	2	3	4	5	6	7
13. Density	1	2	3	4	5	6	7
14. Evaporation, condensation	1	2	3	4	5	6	7
15. Temperature and pressure relationship	1	2	3	4	5	6	7

B. Have you felt the need to know the following laboratory skills?

1. to use a beam balance	1	2	3	4	5	6	7
2. to use a graduated cylinder	1	2	3	4	5	6	7
3. to use a thermometer	1	2	3	4	5	6	7
4. to use a barometer	1	2	3	4	5	6	7
5. to use a power supply (AC & DC)	1	2	3	4	5	6	7
6. to prepare percent solution	1	2	3	4	5	6	7
7. to prepare molar solutions	1	2	3	4	5	6	7
8. to weigh and measure chemicals accurately	1	2	3	4	5	6	7
9. to calibrate a) a standard scale	1	2	3	4	5	6	7
b) a given container	1	2	3	4	5	6	7
10. to collect and identify basic types of rocks and common minerals	1	2	3	4	5	6	7
11. to test rocks and minerals for hardness, streak, cleavage and other physical properties	1	2	3	4	5	6	7
12. to cut, shape and polish glass rods and tubings	1	2	3	4	5	6	7
13. to use the following instruments							
a. protractor	1	2	3	4	5	6	7
b. drawing compass	1	2	3	4	5	6	7
14. to use scientific notation and significant digits in recording measurements	1	2	3	4	5	6	7

15. perform the following computational skills
 - a. convert from one unit to another 1 2 3 4 5 6 7
 - b. compute with measures recorded in scientific notation with consideration for significant digits 1 2 3 4 5 6 7
 16. Translate from one form to another (words, symbols) statements regarding
 - a. ratio and proportion 1 2 3 4 5 6 7
 - b. direct and inverse proportion 1 2 3 4 5 6 7
 - c. direct square proportion and inverse square proportion 1 2 3 4 5 6 7
 17. to construct the following
 - a. drawings of 2 or 3-dimensional geometric figures 1 2 3 4 5 6 7
 - b. scale drawings of geometric figures 1 2 3 4 5 6 7
 - c. graphs of empirical data or of equations 1 2 3 4 5 6 7
 18. to perform the following interpretative skills
 - a. given a graph (cartesian) or two quantities, establish the relationship between these two quantities 1 2 3 4 5 6 7
 - b. draw inferences from a semilogarithmic graph 1 2 3 4 5 6 7
 - c. draw inferences from equations of functional relationships 1 2 3 4 5 6 7
- C. 1. Which of the following areas should the summer institute focus on for it to be of greatest use to you? Rank the areas according to the degree of usefulness to you. Assign the same rank to areas which are equally useful to you.

AREA	RANK
Content	_____
Use of Laboratory Equipment/Instrument	_____
Laboratory Procedures and Techniques	_____
Construction of Simple Laboratory Devices	_____
Mathematical Skills	_____
Methods of Teaching	_____
Evaluation of Student Performance	_____
Philosophy of Science	_____

2. Considering that you have only six weeks of summer we would like to know your expectations as participants in the summer institute. Please check only those which you think are important to you.

I expect to receive some training on

- | | |
|-------|---------------------------------------|
| _____ | content |
| _____ | laboratory procedures and techniques |
| _____ | improvising simple laboratory devices |
| _____ | making teaching aids |
| _____ | test construction and analysis |
| _____ | methods of teaching |
| _____ | philosophy of science |
| _____ | others (specify) _____ |

I expect that the institute will have

- _____ a planned program of activities
- _____ competent instructors
- _____ capable resource persons
- _____ efficient administrative staff
- _____ adequate laboratory facilities
- _____ satisfactory library facilities
- _____ appropriate teaching aids
- _____ lecture demonstrations
- _____ lecture hand-outs
- _____ classroom interaction between teacher
- _____ and participants and among participants
- _____ tests and/or term papers required of
- _____ participants
- _____ at least one field trip
- _____ socials and outings
- _____ a committee for tours in and out of campus
- _____ reasonable board and lodging fees
- _____ stipends immediately released to partici-
- _____ pants
- _____ others (specify) _____

Needs of Science Teachers

Listed below are specific topics and laboratory skills in Geometry. Do you need to be updated or trained on these topics or skills? To help you answer the question, the following scale is provided.

Not at all 1 2 3 4 5 6 7 Very much

Very much and Not at All are the opposite extremes of the scale. Number 7 represents Very Much, while number 1 stands for Not At All. Number 4 marks the neutral point. The scale is written opposite each item below. For each item, ENCIRCLE the number corresponding to your answer to the given question.

A. Do you need to be updated on the following topics?

- | | | | | | | | |
|-----------------------------------|---|---|---|---|---|---|---|
| 1. Proofs | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. Angles and Angular Measures | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. Triangles | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. Congruence | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. Inequalities | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. Indirect proof | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. Parallelism | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. Proportionality | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. Similarity | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. Quadrilaterals | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. Circles and Spheres | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12. Arcs and angles of a circle | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13. Areas and volumes | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14. Geometric constructions | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15. Coordinate systems on a plane | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

- B. 1. Which of the following areas should the summer institute focus on for it to be of greatest use to you? Rank the areas according to the degree of usefulness to you. Assign the same rank to areas which are equally useful to you.

RANK

RANK

Content	_____
Use of Laboratory Equipment/Instruments	_____
Laboratory Procedures and Techniques	_____
Construction of Simple Laboratory Devices	_____
Mathematical Skills	_____
Methods of Teaching	_____
Evaluation of Student Performance	_____
Philosophy of Science	_____

2. Considering that you have only six weeks of summer, we would like to know your expectations as participants in the summer institute. Please check only those which you think are important to you.

I expect to receive some training on

_____	content
_____	laboratory procedures and techniques
_____	improvising simple laboratory devices
_____	making teaching aids
_____	test construction and analysis
_____	methods of teaching
_____	philosophy of science
_____	others (specify) _____

I expect that the institute will have

- _____ a planned program of activities
- _____ competent instructors
- _____ capable resource persons
- _____ efficient administrative staff
- _____ adequate laboratory facilities
- _____ satisfactory library facilities
- _____ appropriate teaching aids
- _____ lecture demonstrations
- _____ lecture hand-outs
- _____ classroom interaction between teacher
and participants and among participants
- _____ tests and/or term papers required of
participants
- _____ at least one field trip
- _____ socials and outings
- _____ a committee for tours in and out of campus
- _____ reasonable board and lodging fees
- _____ stipends immediately released to partici-
pants
- _____ others (specify) _____

- II

PART A

For each statement on the left, please encircle the number that best estimates what you do in your science or mathematics class using the following code:

- 5 = Always
4 = Often
3 = Depends (Sometimes yes, sometimes no)
2 = Occasionally
1 = Never

	Never	Occasionally	Depends	Often	Always
1. I start the lesson by giving the objectives to the students.	1	2	3	4	5
2. I see to it that my test items match the objectives that were given	1	2	3	4	5
3. I follow the lessons in the UP SEC textbook.	1	2	3	4	5
4. Students of the class perform the experiments or activities in the UP SEC text.	1	2	3	4	5
5. I perform the demonstration and experiments suggested in the UP SEC text.	1	2	3	4	5

(Over)

PART B

6. Do you use the UP SEC book for your course? (Please check one).

☐ No
☐ Yes, as a reference
☐ Yes, as the text

7. Has your high school principal been helpful in implementing what you learned from the RSTC In-Service Training Program? (Please check one).

☐ Very helpful
☐ Moderately helpful
☐ Somewhat helpful
☐ Not at all

8. How many of the students in your class have the UP SEC book? (Please check one).

☐ Almost all students
☐ About 3/4 of the class
☐ About 1/2 of the class
☐ About 1/4 of the class
☐ Very few (less than 1/4)

9. For the chapters that you have taken up in class, approximately how many of the lessons available in the UP SEC text did you follow in your class? (Please check one).

☐ Almost all
☐ About 3/4 of the lessons
☐ About 1/2 of the lessons
☐ About 1/4 of the lessons
☐ Very few (less than 1/4)

10. How much of the equipment needed for the UP SEC course that you are teaching are available to your class? (Please check one).

☐ Almost all
☐ About 3/4
☐ About 1/2
☐ About 1/4
☐ Very few (less than 1/4)

11. Did you receive the UP SEC textbooks on time for the school year?

☐ YES ☐ NO

12. Did your school receive the Kits or Equipment from the UNICEF on time for the school year?

☐ YES ☐ NO

13. After your RSTC Training program, did you make any request from your school administrators about some funding for your science or mathematics class in order to implement what you learned from the summer institute?

_____ YES _____ NO

How much of your request was granted? (Please check one).

_____ All of the request
 _____ About 3/4 of the request
 _____ About 1/2 of the request
 _____ About 1/4 of the request
 _____ None

PART C

14. Below is a list of factors that may cause difficulty in implementing what you learned from the RSTC Summer Institute. Please check only those that are important to you.

_____ Size of class (too many students)
 _____ Limited rooms, space
 _____ Inadequate facilities (water, electricity)
 _____ Lack of supplies
 _____ Lack of equipment
 _____ Lack of textbooks
 _____ Indifference of administrators
 _____ Insufficient training
 _____ Short class periods
 _____ Others (please specify) _____

15. When you teach the lessons in the UP SEC materials, do you make your own modifications of the lessons? (Please check one).

I made:

_____ None (no modifications)
 _____ Very few (less than 1/4)
 _____ Moderate (about 1/2)
 _____ Extensive (more than 3/4)

16. Assuming (just assuming) that there are 100 lessons available for your science or mathematics class from the UP SEC materials, and considering the many problems that you may have in implementing the course (such as lack of textbooks, equipment, supplies, etc.), approximately how many of the 100 available lessons are you able to present in your class?

_____ lessons out of 100 lessons

(Number of)

17. Approximately what percent of what you learned in the RSTC In-Service Training (not necessarily following the UP SEC text) are you able to implement in your class? (Please check one).

_____ Almost all (100%)
 _____ Approximately 80%
 _____ About 60%
 _____ About 40%
 _____ About 20%

235

(Over)

18. Which of the following did you receive after your RSTC Training? (Please check those that apply).

☐ Promotion in rank
☐ Raise in salary
☐ Change in designation
☐ Others (please specify) _____

19. What additional responsibilities have been given to you after returning from the RSTC Summer Science Institute? (Please check those that apply).

☐ Administrative
☐ Workshop leader
☐ Conducting in-service training for other teachers
☐ Producing written instructional materials
☐ Producing or devising equipment
☐ Others (please specify) _____

20. What incentives did your school administrators offer to teachers upon your return from the RSTC Training? (Please check those that apply).

☐ Given raise in salary
☐ Was promoted in rank
☐ Given less teaching load
☐ Given recognition (e.g., became a demonstration leader)
☐ Sent to another seminar or workshop
☐ Prompt action given to your requisition for supplies and materials
☐ Immediate action on the textbooks ordered
☐ Gave serious consideration to proposed curricular changes
☐ Others (please specify) _____

ATTITUDE AND INTEREST TOWARDS SCIENCE AND SCIENCE TEACHING

This questionnaire is concerned with finding out your feelings and attitude towards your career as a science teacher and toward science as a subject in your high school. It is part of a research project and for this instrument to function properly, it is important that you answer each item honestly. There is no right or wrong answer but the best answer is what you think most closely resembles your own feeling about each statement. All your responses will be kept strictly confidential. Please consider each item carefully. Your responses will in no way affect your standing in your profession.

For each statement, circle a number which most closely resembles your feeling toward the statement. If you strongly agree with the statement, circle 7; if you strongly disagree with the statement, circle 1. If your feelings fall in between the two extremes, circle a number between 1 and 7. Place your responses on the accompanying answer sheet. Please return to us the answer sheet in the enclosed stamped and addressed envelope.

STRONGLY
DISAGREE

1 2 3 4 5 6 7

STRONGLY
AGREE

1. I prefer to teach science to any other academic subject.
2. Being a science teacher is an exciting profession.
3. Being a science teacher may be all right for some persons but I doubt if I should be one.
4. Being a science teacher is mostly hard work with little or no satisfaction.
5. Teaching science is highly rewarding in different ways.
6. Part of the time I enjoy teaching science, most of the time I don't.
7. Being a science teacher ranks me quite high in the teaching profession.
8. I feel I have accomplished little as a science teacher.
9. I do not mind continuing my career as a science teacher.
10. I really enjoy being a science teacher.
11. I get all the help and encouragement from my high school administrators in my effort to teach science.
12. There is no need to be concerned over the shortage of good science teachers in this country.
13. My high school administrators encourage me to become a better science teacher.
14. Science is very interesting to me.
15. A course in science is an important contribution to the total education of each student.

16. I think the administrators in my high school will help me acquire most of the things I need to teach science.
17. Many students should not study science because it is too difficult for them.
18. In my school, I get all the support to do a good job of teaching science.
19. Only bright students should be admitted to science classes.
20. I find science to be fascinating and a lot of fun.
21. It makes me nervous to even think of science.
22. The principal of my high school should be given much credit for making the school offer a good science course.
23. I am in favor of science being a required course in high schools.
24. I derive much self satisfaction by being a science teacher.
25. I have problems like lack of laboratory space, too few equipment, and insufficient teaching aid in my science class.
26. Studying science develops the mind.
27. To learn science well one must commit to memory many different facts.
28. I get very little from my school on what I need in my science class.
29. I wish I were teaching a course other than science.
30. Attending the summer institute made me more enthusiastic as a science teacher.

Attitude and Interest Towards
Science and Science Teaching

ANSWER SHEET

1.	1	2	3	4	5	6	7
2.	1	2	3	4	5	6	7
3.	1	2	3	4	5	6	7
4.	1	2	3	4	5	6	7
5.	1	2	3	4	5	6	7
6.	1	2	3	4	5	6	7
7.	1	2	3	4	5	6	7
8.	1	2	3	4	5	6	7
9.	1	2	3	4	5	6	7
10.	1	2	3	4	5	6	7
11.	1	2	3	4	5	6	7
12.	1	2	3	4	5	6	7
13.	1	2	3	4	5	6	7
14.	1	2	3	4	5	6	7
15.	1	2	3	4	5	6	7
16.	1	2	3	4	5	6	7
17.	1	2	3	4	5	6	7
18.	1	2	3	4	5	6	7
19.	1	2	3	4	5	6	7
20.	1	2	3	4	5	6	7
21.	1	2	3	4	5	6	7
22.	1	2	3	4	5	6	7
23.	1	2	3	4	5	6	7
24.	1	2	3	4	5	6	7
25.	1	2	3	4	5	6	7
26.	1	2	3	4	5	6	7
27.	1	2	3	4	5	6	7
28.	1	2	3	4	5	6	7
29.	1	2	3	4	5	6	7
30.	1	2	3	4	5	6	7

Attitude and Interest Towards
Science and Science Teaching

ANSWER SHEET

1.	1	2	3	4	5	6	7
2.	1	2	3	4	5	6	7
3.	1	2	3	4	5	6	7
4.	1	2	3	4	5	6	7
5.	1	2	3	4	5	6	7
6.	1	2	3	4	5	6	7
7.	1	2	3	4	5	6	7
8.	1	2	3	4	5	6	7
9.	1	2	3	4	5	6	7
10.	1	2	3	4	5	6	7
11.	1	2	3	4	5	6	7
12.	1	2	3	4	5	6	7
13.	1	2	3	4	5	6	7
14.	1	2	3	4	5	6	7
15.	1	2	3	4	5	6	7
16.	1	2	3	4	5	6	7
17.	1	2	3	4	5	6	7
18.	1	2	3	4	5	6	7
19.	1	2	3	4	5	6	7
20.	1	2	3	4	5	6	7
21.	1	2	3	4	5	6	7
22.	1	2	3	4	5	6	7
23.	1	2	3	4	5	6	7
24.	1	2	3	4	5	6	7
25.	1	2	3	4	5	6	7
26.	1	2	3	4	5	6	7
27.	1	2	3	4	5	6	7
28.	1	2	3	4	5	6	7
29.	1	2	3	4	5	6	7
30.	1	2	3	4	5	6	7

Form A-9

Questionnaire for Integrated Chemistry-Physics Trainees

Subject _____ Date _____

Instructions:

In responding to the items below, try to recall the training you had this summer. It would be best if you could refer to the book(s) that you used in the course.

1. Did you undergo training in (check one):

- ☐ a. Physics only
☐ b. Chemistry only
☐ c. Physics and Chemistry Integrated

2. Encircle the chapters in "Fundamentals of Physics" that were taken up in the Summer Institute.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

3. Encircle the chapters in "Practical Chemistry for Secondary Schools" that were taken up in the Summer Institute.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23

4. Did you take up topics that are not found in any of the two books mentioned?

☐ Yes ☐ No

5. If your answer to item 4 is Yes, please list down the topics.

6. If given the choice and considering the time allowed, would you prefer to study (check one):

- ☐ a. Physics only
☐ b. Chemistry only
☐ c. Physics and Chemistry Integrated.

7. Briefly state your reason(s).

8. Is one summer in-service training adequate for your needs as a science teacher? (Please check one).

_____ Yes _____ Uncertain _____ No

9. Were you generally satisfied with the training you had this summer?

_____ Yes _____ No

10. Briefly explain your answer.

Questionnaire for Sequential and Crash Chemistry
Course Trainees

Subject _____ Date _____

Instructions:

In responding to the items below, try to recall the training you had this summer. It would be best if you could refer to the book(s) that you used in the course.

1. Encircle the chapters in "Practical Chemistry for Secondary Schools" that were taken up in the 1976 Summer Institute.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23

2. Encircle the chapters in "Practical Chemistry for Secondary Schools" that were taken up in the 1977 Summer Institute.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23

3. Did you take up topics that are not found in the book mentioned above?

_____ Yes _____ No

4. If your answer to item 3 is Yes, please list down the topics.

5. If given the choice and considering the time allowed, which of the following would you prefer? (Please check one).

_____ a. Sequential Chemistry (2 summers)
_____ b. Crash Chemistry (1 summer)

6. Briefly state the reason(s) for your choice in number 5 above.

7. Were you generally satisfied with the training you had this summer?

_____ Yes _____ No

- 2 -

8. If your answer to No. 7 is Yes, check the reason(s) for being satisfied.

☐ Superior instruction
☐ Adequate facilities
☐ Interesting and well-organized lessons
☐ Requirements are relevant to the lessons
☐ Others (please specify) _____

- If your answer to No. 7 is No, check the reason(s) for not being satisfied.

☐ Poor instruction
☐ Inadequate facilities
☐ Lessons are too boring
☐ Too many requirements
☐ Others (please specify) _____

(END)

A-10

Questionnaire for Teachers who did not Return for
the Second Summer

1. Name: _____
 LAST FIRST MIDDLE
2. Name of the school where you are presently teaching:

3. Address of your school: _____
4. Reason(s) why you did not return in the summer of 1977
for the second part of the sequential Chemistry course:
(Please check only those that apply to you.)
- _____ a. I feel that one summer of training is adequate
for my course.
- _____ b. I am not able to implement what I trained for,
anyway.
- _____ c. I did not benefit much from the training.
- _____ d. After the training, I was assigned to teach
another subject.
- _____ e. My administrator does not grant my request for
funds (for books, supplies, equipment, etc.) to
help implement what I learned.
- _____ f. The school administrator did not allow me to return.
- _____ g. Our Chemistry course was integrated with Physics.
- _____ h. Other reasons (Please describe):

Questionnaire for the Regional
Science Teaching Center Participants
from 1971 to 1974

1. Name: (Please Print) _____
FAMILY FIRST MIDDLE
2. Subject You Trained In at the RSTC: _____
3. Year You Trained at the RSTC: 197__ to 197__
(Inclusive years)
4. Please check all the subjects which you taught AFTER you
trained at the RSTC. Check only the school year(s) in which
you taught the subject.

SUBJECT(S) TAUGHT	SCHOOL YEAR			
	1971-72	1972-73	1973-74	1974-75
a) Physics				
b) Chemistry				
c) Biology				
d) Gen. Science				
e) Mathematics				
f) Others (Please specify)				

5. If you no longer teach the subject you trained in at the RSTC, what could be the reasons? (Please check those that apply.)

Change in curriculum
Greater demand for teachers in other subjects (not science or mathematics)
Too many teachers trained in that subject
Others, please specify

6. Are you still in the same school which sent you to the RSTC?

YES

NO

- If not, why did you transfer? (Please check those that apply to you.)

_____ higher salary elsewhere
_____ more attractive fringe benefits in other schools
_____ greater opportunities for advancement in the new job
_____ a more challenging job elsewhere
_____ a more prestigious job elsewhere

- 2 -

☐ personal conflict with superiors
☐ misunderstanding with peers
☐ personal/family reasons
☐ transfer of residence
☐ others, please specify _____

7. Do you still use the UP SEC book for the subject you trained in? (Please check one).

☐ No
☐ Yes, as a reference
☐ Yes, as the text

8. For the chapters that you have taken up in class, approximately how many of the lessons available in the UP SEC text did you follow in your class? (Please check one).

☐ Almost all
☐ About $3/4$ of the lessons
☐ About $1/2$ of the lessons
☐ About $1/4$ of the lessons
☐ Very few (less than $1/4$)

9. Assuming (just assuming) that there are 100 lessons from the UP SEC materials available for your science or mathematics class, considering the many problems that you may have in implementing the course (such as lack of textbooks, equipment, supplies, etc.), approximately how many of the 100 available lessons are you able to present in your science/mathematics class?

_____ lessons out of 100 lessons.

(Number of)

10. Approximately what percent of what you learned in the RSTC In-service Training (not necessarily following the UP SEC Text) are you able to implement in your class? (Please check one).

☐ Almost all (100%)
☐ Approximately 80%
☐ About 60%
☐ About 40%
☐ About 20%
☐ Almost none (0%)

11. Has your high school principal been helpful in implementing what you learned from the RSTC In-service Training Program? (Please check one).

☐ Very helpful
☐ Moderately helpful
☐ Somewhat helpful
☐ Not at all

12. Which of the following did you receive after your RSTC training? (Please check those that apply).

☐ Raise in salary
☐ Promotion in rank
☐ Change in designation
☐ Reduced teaching load
☐ Others, please specify _____

13. Aside from your teaching duties, which of the following functions did you perform AFTER your training? Check only those school year(s) in which you performed each function.

FUNCTIONS	SCHOOL YEAR			
	1971-72	1972-73	1973-74	1974-75
a. Conducted echo seminars, workshops and demonstration classes				
b. Did research work				
c. Produced curriculum materials				
d. Devised or produced equipment				
e. Participated in seminars, workshops and demonstration lessons				
f. Did administrative work.*				
g. Attended conferences on science/mathematics teaching				

* Please write a if department head, b if principal, and c if supervisor.

14. For each school year following your training at the RSTC, please check the extent to which you implemented what you learned at the RSTC training. Almost all and Almost None are the extreme opposites of the scale. (Please check only those school year(s) that apply to you.)

EXTENT OF IMPLEMENTATION	SCHOOL YEAR			
	1971-72	1972-73	1973-74	1974-75
a) Almost all of what I learned				
b) Approximately 75%				
c) About 50%				
d) About 25%				
e) Almost none (0%)				

15. For each statement on the left, please encircle the number that best estimates what you do in your science or mathematics class using the following code:

5 = Always
 4 = Often
 3 = Depends (Sometimes yes, sometimes no)
 2 = Occasionally
 1 = Never

	Never	Occasionally	Depends	Often	Always
a) I start the lesson by giving the objectives to the students.	1	2	3	4	5
b) I see to it that my test items match the objectives that were given.	1	2	3	4	5
c) I follow the lessons in the UP SEC textbook.	1	2	3	4	5
d) Students of the class perform the experiments or activities in the UP SEC text.	1	2	3	4	5
e) I perform the demonstrations and experiments suggested in the UP SEC text.	1	2	3	4	5

Questionnaire for the
MAT Participants
from 1971 to 1974

1. Name: _____
(Last) (First) (Middle Initial)
2. Permanent Address: _____

3. School and School Address: _____

4. When did you take your MAT program at U.P.? _____
(inclusive years)
5. Major subject in MAT: _____
6. RSTC or school that sponsored you to take the MAT program: _____

7. While you were on the MAT scholarship, what privileges did your school extend to you? Please check those that apply to you.
 _____ free transportation
 _____ full salary was given while on study leave
 _____ half of the salary was given while on study leave
 _____ difference of salary and stipend was given
 _____ book allowance
 _____ others (please specify) _____

8. Are you still connected with the RSTC or school that sponsored you to take the MAT program?
 _____ Yes _____ No
9. If you have left the RSTC or school that sponsored you, when did you leave? (give year) _____
 What were your reasons for leaving/transferring to another institution? Please check those that apply to you.
 _____ higher salary was offered by another institution
 _____ efforts were not given due recognition
 _____ no promotion since returning to RSTC/institution
 _____ laboratory facilities were inadequate
 _____ library facilities were inadequate
 _____ poor living conditions in locality
 _____ inconvenient time schedule
 _____ no academic freedom
 _____ heavy teaching load (more than 15 hours/week)
 _____ many extracurricular activities without honorarium
 _____ disagreement with RSTC/university administration
 _____ others (please specify) _____

10. What do you think are some of the benefits you have received as a result of having finished the MAT program?
 _____ increase in salary
 _____ promotion in rank
 _____ less teaching load
 _____ others (please specify) _____

11. Listed below are functions which you may have done after undergoing the MAT program. Check the school year(s) in which you performed the functions listed below.

Functions	School Year			
	1971-1972	1972-1973	1973-1974	1974-1975
1. Followed-up teacher participants				
2. Evaluated echo-seminars				
3. Taught graduate courses				
4. Taught under-graduate courses				
5. Conducted in-service programs with the teachers at the RSTC				
6. Did research work				
7. Did administrative work				
8. Others (please specify) _____ _____				

12. Do you think the MAT course helped prepare you for the functions mentioned above?

_____ Yes _____ No

13. List the position you held immediately before the MAT program and all positions you held thereafter.

Position	Level*	Institution	Inclusive Dates
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

* elementary, secondary, college/university

14. Has your training given you some confidence in your present job?

hardly 1 2 3 4 5 6 7 very much

15. After the MAT, did you study again for another degree?

_____ Yes _____ No

If Yes, what degree program and in what school?

Year Graduated: _____

16. Are you still actively involved in science?

not at all seldom Moderately much very much

Questionnaire for RSTC Administrators

Selection Policy

1. How do you disseminate the information about the scholarships to the science teachers in the region? Please check the procedure/s you use.

A. By sending a letter or telegram to:

- ☐ a. superintendents in the division
☐ b. principals of schools within the region
☐ c. science supervisors in the division
☐ d. concerned teachers in schools

B. Through announcements in seminars, meetings and workshops of:

- ☐ a. teachers
☐ b. high school principals and administrators

2. A. In your letter to the principals, do you ask recommendees for the summer science institute?

☐ Yes ☐ No

B. Do you accept applications directly from the teachers?

☐ Yes ☐ No

3. A. Do you screen the recommendees/candidates to the summer institute?

☐ Yes ☐ No

B. Below are some items for consideration in the selection of teacher participants. Please rank the items in the order of importance according to your own way of screening applications. Designate the most important as 1, next important as 2, and then 3, and so on. Do not give equal ranks.

- ☐ a. scholastic standing (transcript of record)
☐ b. teaching experience
☐ c. recommendation of superintendent/principal
☐ d. attitude of candidates
☐ e. commitment to program
☐ f. need of the high school
☐ g. age
☐ h. sex
☐ i. others (please specify) _____

- C. Is there an assigned screening board of applicants in the RSTC for this purpose?

☐ Yes ☐ No

Are they staff members of the RSTC?

☐ Yes
☐ No
☐ Others (Please specify) _____

4. Approximately what percentage of distribution of teacher participants do you follow? Please check.

☐ a. 100% Private
☐ b. 75% Private, 25% Public
☐ c. 50% Private, 50% Public
☐ d. 25% Private, 75% Public
☐ e. 100% Public
☐ f. Others, please specify _____

5. What incentives are given by the RSTC to the teacher-participants? Please check those that apply.

☐ a. stipend
☐ b. book allowance
☐ c. free board and lodging
☐ d. some equipment hand-out
☐ e. a copy of the Teacher's Guide
☐ f. a copy of text of their subject
☐ g. transportation to go to RSTC and back
☐ h. others, please specify _____

Personnel

1. A. How many instructors (MAT graduate or trainees) per subject area teach in the summer institute?

	<u>No. of Instructors</u>				
	1975	1974	1973	1972	1971
Chemistry	_____	_____	_____	_____	_____
Physics	_____	_____	_____	_____	_____
Biology	_____	_____	_____	_____	_____
Gen. Science	_____	_____	_____	_____	_____
Geometry	_____	_____	_____	_____	_____

- B. Do all the summer 1975 instructors come from your center?

☐ Yes
 ☐ No

2. If you do not have enough instructors for the institute, how do you solve this problem?

☐ a. invite MAT instructors from other centers or colleges
☐ b. take in applicants from other related science training programs
☐ c. get college instructors (non-MAT) from the RSTC

3. What incentives do you give your instructors?

	<u>Faculty of RSTC</u>		<u>Those Invited</u>	
Honorarium (How much)	_____	_____	_____	_____
Travel expenses	_____ Yes _____ No	_____ Yes _____ No	_____ Yes _____ No	_____ Yes _____ No
Free board	_____ Yes _____ No	_____ Yes _____ No	_____ Yes _____ No	_____ Yes _____ No
Free lodging	_____ Yes _____ No	_____ Yes _____ No	_____ Yes _____ No	_____ Yes _____ No

4. A. How many of your staff did you send for the MAT programs?

- a) _____ Physics
- b) _____ Chemistry
- c) _____ Gen. Science
- d) _____ Biology
- e) _____ Mathematics

B. How many of them are still with your RSTC at present?

- a) _____ Physics
- b) _____ Chemistry
- c) _____ Gen. Science
- d) _____ Biology
- e) _____ Mathematics

C. If they are not with you anymore, where did they go?

	How many
_____ another school	_____
_____ private life	_____
_____ industry	_____

5. What incentives did the MAT participants receive since their return?

- _____ a. increase in pay
- _____ b. promotion in rank
- _____ c. less teaching load

6. Please indicate how many of your MAT instructors perform the following activities during the year?

	No. of Instructors
a. follow up of teacher participants	_____
b. evaluation of echo seminars	_____
c. teach graduate courses	_____
d. teach undergraduate courses	_____
e. conduct in service program with teachers at the RSTC	_____
f. research	_____
g. administration	_____
h. others (please specify)	_____

7. What courses are the MAT instructors teaching at the RSTC during the year?

- _____ a. college courses (e.g., botany, college physics, etc.)
- _____ b. methods courses for undergraduate education students
- _____ c. high school science courses

8. Do you plan on continuing the present summer institute programs in your RSTC? (Please check one only).

- _____ No longer
- _____ One more year
- _____ Two more years
- _____ About five more years
- _____ Indefinitely

9. Does the administration (president/board of trustees/
dean/director), as a whole, favor the continuance of the
RSTC indefinitely?
- _____ Yes _____ Not certain _____ No
10. In addition to SSI, which of the following in-service
programs do you conduct for teachers in your area?
- _____ 1. Saturday workshops
_____ 2. Special short term courses
_____ 3. 2-3 day seminars during the school year
11. Which of the following benefits do you consider accrue to
your school due to the presence of RSTC? (Please check).
- _____ a. Prestige
_____ b. Financial gain
_____ c. Increase enrollment
_____ d. Accreditation
_____ e. Equipment
_____ f. Physical facilities improvement
_____ g. Library resources
_____ h. Attracted good faculty members
_____ i. Prominence
 _____ 1) local
 _____ 2) international
_____ j. Scholarship grants/aids
 _____ 1) local
 _____ 2) foreign
_____ k. Study grants
_____ l. Travel grants
_____ m. Others (please specify) _____
12. Which of the following have been influenced by the presence
of the RSTC in your school? Please check.
- _____ a. Curricular changes in the undergraduate programs
_____ b. Curricular changes in the graduate programs
_____ c. Added prestige to faculty members of science
 _____ departments
_____ d. Curriculum development
_____ e. Salary of faculty members
_____ f. Research
_____ g. Others (please specify) _____

Questionnaire on Course and Conditions of Teaching
Questionnaire for RSTC Instructors

1. Name:
 LAST FIRST MIDDLE INITIAL

2. Sex: Male Female

3. Age: Years

4. College/University where degree was obtained:

Institution	Degree	Major	Minor	Year Graduated
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

5. What subject and in which RSTC are you presently teaching?
 (Please check)

RSTC	SUBJECT
<u> </u> St. Louis University	<u> </u> Physics
<u> </u> Aquinas University	<u> </u> Chemistry
<u> </u> Silliman University	<u> </u> Biology
<u> </u> Ateneo de Davao	<u> </u> General Science
<u> </u> Notre Dame of Marbel	<u> </u> Mathematics

6. On which materials did you base your syllabus? (Please check)

 UPSEC materials

 Syllabi of previous institutes

 Foreign curriculum materials (Please specify)

 Bureau of Public Schools teaching guide

 Others (Please specify)

7. As you teach, do you strictly follow the syllabus?

 Yes No

8. If you did not strictly follow the syllabus, what changes did you make, if any, in your prepared syllabus?

9. What problems did you encounter during the summer institute?
 For each item below please encircle the number which you think applies to your RSTC. Use the following code:

- 1 = not a problem
 2 = somewhat of a problem
 3 = a very serious problem

Not a problem	Somewhat of a problem	A very serious problem	
1	2	3	a) Laboratory facilities are inadequate.
1	2	3	b) Equipment for laboratory exercises are inadequate or do not function properly.
1	2	3	c) Difficulty of getting clerical help.
1	2	3	d) Needed supplies and materials are not available.
1	2	3	e) Needed teaching aids are not available.
1	2	3	f) Poor subject matter background of teacher.
1	2	3	g. Library resources are insufficient
1	2	3	h. Time to cover materials is insufficient.
1	2	3	i. Lack of support of RSTC administration (Director, coordinator)
1	2	3	j. Lack of support of university administration (President or Rector)

10. The following is a list of words/phrases describing the group of teacher trainees. For each item, circle the number which you feel applies to your own class using the following code:

- 1 = very few of the trainees
 2 = few of the trainees (about 1/4 of the class)
 3 = half of the trainees
 4 = most of the trainees (about 3/4 of the class)
 5 = almost all

1	2	3	4	5	a) enthusiastic
1	2	3	4	5	b) unruly
1	2	3	4	5	c) friendly
1	2	3	4	5	d) competitive
1	2	3	4	5	e) innovative
1	2	3	4	5	f) indifferent
1	2	3	4	5	g) resourceful
1	2	3	4	5	h) uninterested
1	2	3	4	5	i) inquisitive
1	2	3	4	5	j) defies authority
1	2	3	4	5	k) engage in discussions
1	2	3	4	5	l) cooperative
1	2	3	4	5	m) confused in what is going on
1	2	3	4	5	n) do independent readings
1	2	3	4	5	o) receptive to changes
1	2	3	4	5	p) involved in activities

11. Are you a faculty member of the university/college to which the RSTC is attached? _____ Yes _____ No

If your answer to question (11) is NO, continue with Questions 12 to 16; if YES, proceed to Questions 17 to 21.

- 3 -

12. What school are you now a regular faculty member of?

Name of School

Address of School

13. Would you be willing to teach in future summer institutes in the RSTC? _____ Yes _____ No
14. As a guest instructor, what attracted you to teach in this RSTC? Please check those that apply.

_____ free transportation
 _____ free or reduced board
 _____ free or reduced lodging
 _____ attractive pay for the summer
 _____ change of environment
 _____ close to some relatives or friends
 _____ others (please specify) _____

15. Please check the range of your pay for teaching in the present RSTC summer institute.

_____ below P700 _____ P900 - P1,000
 _____ P700 - P800 _____ above P1,000
 _____ P800 - P900

16. In addition to the RSTC Summer Institute that you are now handling (1975), have you, in the past, been invited to teach in other RSTCs?

_____ Yes _____ No If YES, when and in what RSTC did you teach?

Name of Center

Year

17. If your answer to question 11 is YES, how long have you been with the university/college to which the RSTC is attached? _____ years
18. What incentives have you received as instructor in the RSTC? Please check those that apply.

_____ promotion in rank
 _____ raise in salary
 _____ change in designation
 _____ others, please specify _____

19. Do you feel that the administration has given due recognition to your efforts as a regular member of the RSTC? Please check.

_____ not at all _____ somewhat _____ very much

20. What privileges have been extended to you for teaching in the RSTC this summer? Please check those that apply:

_____ transportation allowance
 _____ free board
 _____ free lodging
 _____ honorarium pay
 _____ free instructional materials and teaching aids
 _____ others, please specify _____

21. How much will you receive for teaching this summer in the RSTC? Please check the range where your salary falls.

_____ below ₱700
 _____ ₱700 - ₱800
 _____ ₱800 - ₱900
 _____ ₱900 - ₱1,000
 _____ above ₱1,000

Item number 22 to 28 will be filled out only by those who took the MAT program in UP.

22. How did the following aspects of the UP MAT program help you conduct the summer institute? Please encircle the number that corresponds to how you feel.

very little	1	2	3	4	5	6	7	very much	a) Educational Psychology
very little	1	2	3	4	5	6	7	very much	b) Methods of research
very little	1	2	3	4	5	6	7	very much	c) Practicum (Educ 280)
very little	1	2	3	4	5	6	7	very much	d) Sci. Educ Courses (Ed 282, 283, 285)
very little	1	2	3	4	5	6	7	very much	e) Content courses
very little	1	2	3	4	5	6	7	very much	f) Other Educ. courses

23. Did your training give you some confidence in your present job at the RSTC?

hardly 1 2 3 4 5 6 7 very much

24. In pursuing the MAT, did you sign a contract with the university?

_____ Yes _____ No

25. Do you think the terms in the contract are reasonable?

_____ Yes _____ Uncertain _____ No

- 5 -

26. When your contract expires, do you think you will remain with the RSTC?

_____ Yes _____ Uncertain _____ No

27. While you were on an MAT scholarship, what privileges did your university extend to you? Please check those that apply:

_____ free transportation
_____ full salary was given while on study leave
_____ half of salary was given while on study leave
_____ difference of salary and stipend given
_____ book allowance
_____ seminar paper allowance
_____ free board and lodging
_____ others, please specify _____

28. Some MAT returnees have left the universities who supported their MAT program. Why do you think those MAT trainees left their RSTCs? Please check possible reasons.

_____ efforts were not given due recognition
_____ no promotion since their return to the RSTC
_____ laboratory facilities were inadequate
_____ library facilities were inadequate
_____ poor living conditions in locality
_____ inconvenient time schedule
_____ no academic freedom
_____ heavy teaching load (more than 15 hrs/wk)
_____ many extracurricular activities without honorarium
_____ disagreement with RSTC/University administration
_____ higher salary elsewhere
_____ others, please specify _____

THANK YOU VERY MUCH

Objectives of Teaching
Teaching of Physics

Dear Physics Teacher:

Below are some general objectives for the teaching of physics. Please rank them according to the degree of importance you attach to the individual items. For example, if objective c is most important to you, put 1 on the space before the item, then put 2 on the objective that is next in importance to c and so on. Do not leave any space blank. Thank you.

- _____ a. Ability to recall important facts, laws and theories of physics.
- _____ b. Knowledge of the methods (induction, deduction, etc.) physicists use to discover and validate knowledge in physics.
- _____ c. Knowledge of the cultural and historical aspects of physics.
- _____ d. Ability to interpret, analyze and apply the topics covered in physics.
- _____ e. Increased understanding and approval of the role of the physicist in our culture.
- _____ f. Skills derived from laboratory manipulation of common physics apparatus.
- _____ g. Ability to use some general techniques of data analysis such as: consideration of errors, numerical statistics, and graphical display.
- _____ h. Increased interest in physics as evidenced by outside reading and discussion about topics in physics.
- _____ i. Acquire a positive attitude toward science in general.
- _____ j. Acquisition of the characteristics (curiosity, open-mindedness, skepticism, etc.) of a good scientist.

Teaching of Chemistry

Dear Chemistry Teacher:

Below are some general objectives for the teaching of chemistry. Please rank them according to the degree of importance you attach to the individual items. For example, if objective c is most important to you, put 1 on the space before the item, then put 2 on the objective that is next in importance to c and so on. Do not leave any space blank. Thank you.

- _____ a. Ability to recall important facts, laws and theories of chemistry.
- _____ b. Knowledge of the methods (induction, deduction, etc.) chemists use to discover and validate knowledge in chemistry.
- _____ c. Knowledge of the cultural and historical aspects of chemistry.
- _____ d. Ability to interpret, analyze, and apply topics covered in chemistry.
- _____ e. Increased understanding and approval of the role of the chemists in our culture.
- _____ f. Skills derived from laboratory manipulation of common chemistry apparatus.
- _____ g. Ability to use some general techniques of data analysis such as: consideration of errors, numerical statistics, and graphical display.
- _____ h. Increased interest in chemistry as evidenced by outside reading and discussion about topics in chemistry.
- _____ i. Acquire a positive attitude toward science in general.
- _____ j. Acquire the characteristics (curiosity, openmindedness, skepticism, etc.) of a good scientist

Teaching of Biology

Dear Biology Teacher:

Below are some general objectives for the teaching of biology. Please rank them according to the degree of importance you attach to the individual items. For example, if objective c is most important to you, put 1 on the space before the item, then put 2 on the objective that is next in importance to c and so on. Do not leave any space blank. Thank you.

- _____ a. Ability to recall important facts, laws, and theories of biology.
- _____ b. Knowledge of the methods (induction, deduction, etc.) biologists use to discover and validate knowledge in biology.
- _____ c. Knowledge of the cultural and historical aspects of biology.
- _____ d. Ability to interpret, analyze and apply the topics covered in biology.
- _____ e. Increased understanding and approval of the role of the biologists in our culture.
- _____ f. Skills derived from laboratory manipulation of common biology apparatus.
- _____ g. Ability to use some general techniques of data analysis such as: consideration of errors, numerical statistics, and graphical display.
- _____ h. Increased interest in biology as evidenced by outside reading and discussion about topics in biology.
- _____ i. Acquire a positive attitude toward science.
- _____ j. Acquire the characteristics (curiosity, openmindedness, skepticism, etc.) of a good scientist.

Teaching of Science

Dear Science Teacher:

Below are some general objectives for the teaching of science. Please rank them according to the degree of importance you attach to the individual items. For example, if objective c is most important to you, put 1 on the space before the item, then put 2 on the objective that is next in importance to c and so on. Do not leave any space blank. Thank you.

- _____ a. Ability to recall important facts, laws, and theories of science.
- _____ b. Knowledge of the methods (induction, deduction, etc.) scientists use to discover and validate knowledge in science.
- _____ c. Knowledge of the cultural and historical aspects of science.
- _____ d. Ability to interpret, analyze and apply the topics covered in science.
- _____ e. Increased understanding and approval of the role of the scientists in our culture.
- _____ f. Skills derived from laboratory manipulation of common science apparatus.
- _____ g. Ability to use some general techniques of data analysis such as: consideration of errors, numerical statistics, and graphical display.
- _____ h. Increased interest in science as evidenced by outside reading and discussion about topics in science.
- _____ i. Acquire a positive attitude toward science in general.
- _____ j. Acquire the characteristics (curiosity, openmindedness, skepticism, etc.) of a good scientist.

Teaching of Mathematics

Dear Mathematics Teacher:

Below are some general objectives for the teaching of mathematics. Please rank them according to the degree of importance you attach to the individual items. For example, if objective c is most important to you, put 1 on the space before the item, then put 2 on the objective that is next in importance to c and so on. Do not leave any space blank. Thank you.

- _____ a. Ability to recall important concepts and principles (formulas, rules, theorems) of mathematics.
- _____ b. Ability to recall the methods (induction, deduction, etc.) mathematicians use to discover and prove mathematical knowledge.
- _____ c. Ability to interpret, analyze and apply mathematical knowledge.
- _____ d. Appreciation and knowledge of the role of mathematics in our culture.
- _____ e. Demonstrate the acquisition of mathematical skills (such as performing mathematical manipulations, estimating, measuring, etc.)
- _____ f. Demonstrate increased interest in mathematics as evidenced by outside reading and discussion about topics in mathematics.
- _____ g. Acquire a positive attitude towards mathematics.
- _____ h. Acquire the characteristics (curiosity, openmindedness, skepticism, etc.) of a good mathematician.

SCIENTIFIC ATTITUDE INVENTORY

Below are some statements about science. Some of them are about the nature of science, while some are about scientists and how they work. The statements describe how you might feel about science. You may agree with some of the statements or you may disagree. That is exactly what you will be asked to do. By doing this, you will show your attitude toward science.

After you have carefully read a statement, decide whether or not you agree mildly or strongly. If you disagree, decide whether you disagree mildly or strongly.

ON A SEPARATE ANSWER SHEET, encircle the symbol that describes how you feel towards each statement. Use the following code.

SA if you strongly agree
A if you mildly agree
U if you are uncertain
D if you mildly disagree
SD if you strongly disagree

1. Scientists discover laws which tell us exactly what is going on in nature.
2. Only scientists can give scientific explanations.
3. I want a job related to science.
4. Producing ideas is an important activity of science.
5. Public understanding of science is necessary.
6. When something is explained well, there is no reason to look for another explanation.
7. A scientist does not have enough time for his family and friends.
8. I enjoy studying science.
9. Scientific laws cannot be changed.
10. Ideas are one of the more important products of science.
11. The work of a scientist is boring.
12. There is no need for the public to understand science.
13. To become a scientist, one must be creative or inventive.
14. Scientists should not criticize each other's work.
15. Working in a science laboratory is interesting.
16. The only value of science is its usefulness in solving practical problems.
17. Theories in science are always true and cannot be changed.
18. If one scientist says a theory is true, all other scientists will believe him.

19. I do not want to be a scientist because it takes too many years of study.
20. The main purpose of science is to discover the laws of nature.
21. Science is so difficult that only scientists can understand it.
22. Some questions cannot be answered by science.
23. I may not make any discovery, but working in science would still be interesting to me.

STUDENT'S PERSONAL DATA FORM

1. Name of Student _____
 LAST FIRST MIDDLE INITIAL
- Year: _____ First _____ Second _____ Third _____ Fourth _____
2. SEX: _____ Male _____ Female AGE: _____ Years
3. Please check the subject in science or math you are now taking. Opposite the subject, PRINT the name of your teacher.

PRESENT
SUBJECT

NAME OF TEACHER

Physics	_____	_____
Chemistry	_____	_____
Biology	_____	_____
General Science	_____	_____
Geometry	_____	_____

4. Occupation of Father (if living) _____
5. Occupation of Mother (if living) _____
6. What is the highest education received by your father and mother? Please check the appropriate lines.

FATHER

MOTHER

Grade 4	_____	_____
Grade 6 or 7	_____	_____
High School Diploma	_____	_____
College Degree	_____	_____
Master's Degree	_____	_____
Doctorate Degree (Ex., Doctor of Philosophy)	_____	_____

7. If your father or mother finished college, what course did he or she take (for example, Education, Law, Medicine, Secretarial, Auto-mechanics)?

Father: _____

Mother: _____

8. Are you a member or officer of a science club in school?
(Please check)

_____ member	_____ neither member nor officer
_____ officer	_____ no science club in school

9. Have you participated in a science quiz?

- ☐ NO ☐ YES. (Check the highest level)
- ☐ within the school
- ☐ provincial or city-wide
- ☐ regional
- ☐ national

10. Have you participated in a science fair?

- ☐ NO ☐ YES. (Check the highest level)
- ☐ within the school
- ☐ provincial or city-wide
- ☐ regional
- ☐ national

11. Do you want to go to college?

- ☐ NO ☐ YES

12. If YES, what course or career do you want to take? _____

13. When you are at home, which of the following activities take up your time? Check only those items which apply to you.

- ☐ listening to the radio
- ☐ watching the television
- ☐ playing a musical instrument
- ☐ calling up friends
- ☐ doing my homework
- ☐ reading newspapers
- ☐ reading local magazines
- ☐ reading foreign magazines
- ☐ reading science fiction books
- ☐ helping with the household work
- ☐ helping with the family business
- ☐ others (specify)

For Nos. 14, 15, and 16, please use the following scale:

Boring 1 2 3 4 5 6 7 Interesting

Boring and interesting are the opposite extremes of the scale.

Number 1 represents boring while number 7 represents interesting.

Number 4 is neutral. For the following 3 questions, encircle the number describing how you rate your science/math courses.

1 2 3 4 5 6 7

14. How do you rate the science courses that you have taken?

1 2 3 4 5 6 7

15. How do you rate the math courses that you have taken?

1 2 3 4 5 6 7

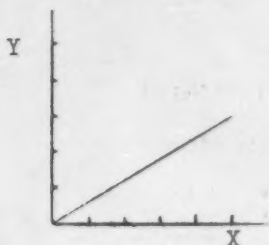
16. In general, how do you rate all the science and math courses that you have taken?

PHYSICS

INSTRUCTIONS: For each number, choose the best answer. On your answer-sheet, mark the letter corresponding to your choice. If you want to change your answer, erase your first answer and mark your new choice. You have one hour to answer these questions.

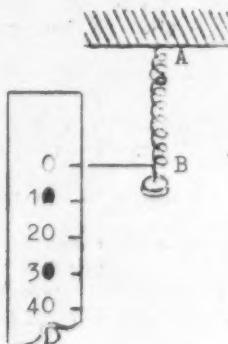
1. Different values of quantities x and y were measured to find out how they are related to each other. These values were plotted as shown in the graph. Which of the following statements would best describe the graph?

- a. y is equal to x
- b. y is proportional to x
- c. y is inversely proportional to x
- d. y is multiplied by x is constant



2. The free end B of an elastic spring is opposite the zero mark on the meter stick. When 10 identical washers were hung on the spring B is opposite the 10 mark. If 20 more identical washers were attached to the spring, B would be opposite which mark?

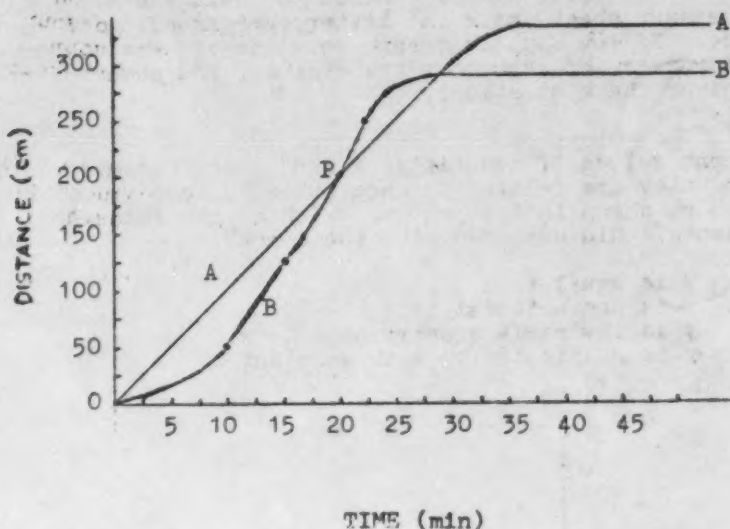
- a. 10 mark
- b. 20 mark
- c. 30 mark
- d. 40 mark



(OVER)

- 2 -

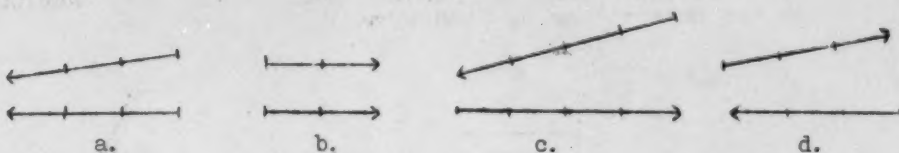
Items 3 to 6 refer to the following distance versus time graphs for two bodies A and B which started from the same point at the same time.



3. From point 0 to P, A is moving
 - a. with constant velocity
 - b. with uniform speed
 - c. with uniform acceleration
 - d. with increasing velocity
4. From 0 to P, B is moving
 - a. with constant velocity
 - b. with decreasing velocity
 - c. with uniform acceleration
 - d. with uniform speed
5. Twenty minutes after A and B moved from the starting point, which of the following is true?
 - a. B overtook A
 - b. A overtook B
 - c. A and B had the same speed
 - d. A and B stopped
6. Which of the following statements is not true?
 - a. B overtook A
 - b. A overtook B
 - c. A and B stopped
 - d. A and B collided
7. Which of the following increases with time if an object is moving with uniform velocity?
 - a. acceleration
 - b. speed
 - c. direction
 - d. distance

.. 3 ..

8. Which statement below describes motion which is not accelerated.
- The object changes direction without changing speed.
 - The object changes speed without changing direction.
 - The object maintains speed and direction.
 - The object moves in uniform circular motion.
9. Which of the following pairs of vectors has the resultant of largest magnitude?

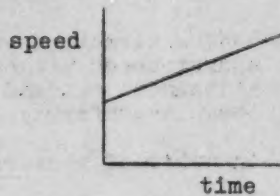


10. A body "A" of mass "m" is being accelerated by a net force, F. If the net force is doubled, then its acceleration is
- doubled.
 - halved.
 - increased four times.
 - decreased to $\frac{1}{4}$.
11. If the same net force F acts on another object "B" of mass equal to $(1/3)m$, then the acceleration of B is
- $(1/3)$ that of A.
 - 3 times that of A.
 - same as A.
 - twice that of A.
12. The mass of an accelerating cart is increased from 1 kg to 3 kg and the net force acting is doubled. The resulting acceleration will be
- $(\frac{1}{3})$ the original.
 - 2 times the original.
 - $(2/3)$ the original.
 - $(1/3)$ the original.
13. The unit of force "newton" is equivalent to
- kilogram $\times$ m/sec.
 - kilogram $\times$ m $\times$ sec².
 - kilogram $\times$ m/sec.
 - kilogram $\times$ m $\times$ sec.
14. Which of the following is not true about "momentum"
- It has a direction.
 - It depends on mass and velocity.
 - It is conserved in a system.
 - It is the same as energy of a body.

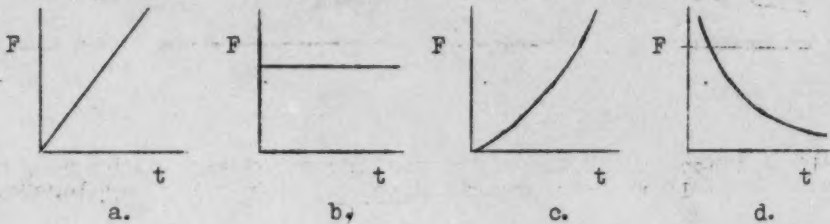
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15. The speed versus time graph for a moving body is shown below



Which of the following graphs shows how the force acting on the object changes with time?



16. If F_1 is the magnitude of the force exerted by the earth on the sun and F_2 is the magnitude of the force exerted by the sun on the earth then
- F_1 is equal to F_2 .
 - F_1 is greater than F_2 .
 - F_1 is less than F_2 .
 - none of the above.

The next two items refer to the following situation.

While in outer space, astronaut pushes a free floating instrument package. The mass of the astronaut is greater than that of the package.

17. The force exerted by the astronaut on the instrument package is
- equal in magnitude to the force exerted by the package on the astronaut.
 - greater than the force exerted by package on astronaut.
 - less than the force exerted by package on astronaut.
 - cannot tell, the information is insufficient.
18. During the push, how would their acceleration compare?
- Acceleration of astronaut is greater than that of package.
 - Acceleration of astronaut is less than that of package.
 - Their acceleration are equal in magnitude but oppositely directed.
 - Their acceleration are equal in magnitude and in the same direction.

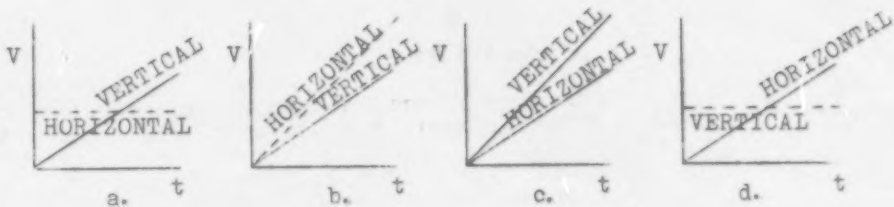
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19. A satellite is in a circular orbit around the earth. Which of the following statements must be true?

1. The speed is constant.
2. The velocity is constant.
3. The period is constant.
4. The acceleration is zero.

- a. 1 and 3 only
- b. 2 and 3 only
- c. 3 and 4 only
- d. 1 and 2 only

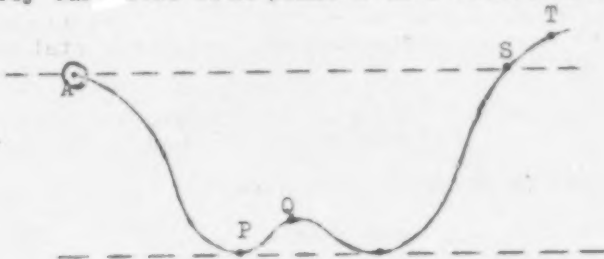
20. A projectile is fired horizontally. It was possible to measure the horizontal and vertical velocities at several points in its path. Which of the following velocity versus time graphs correctly represents the velocities of the projectile.



21. If the diameter of a planet is $\frac{1}{4}$ that of the earth and its mass is the same as the earth's, then your weight on the surface of the planet will be

- a. $\frac{1}{4}$ your weight on earth.
- b. 4 times your weight on earth.
- c. $\frac{1}{2}$ your weight on earth.
- d. 2 times your weight on earth.

22. A toy car moves from point A on a frictionless rail.

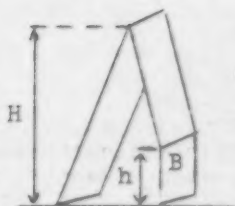


Where will it first stop?

- a. P
- b. Q
- c. S
- d. T

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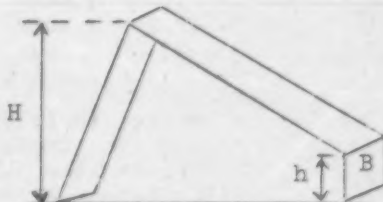
23. A girl wants to slide down a playground slide so that she will have the greatest speed at the bottom (point B). Which of the following playground slides should she choose? (Assume the absence of friction)



(1)



(2)



(3)

- a. 1
 - b. 2
 - c. 3
 - d. any of the slides
24. An object is hung on a vertical spring and made to move up and down. At any instant, the system's total energy is
- a. Kinetic energy + elastic potential energy + gravitational potential energy
 - b. Kinetic energy + elastic potential energy
 - c. Kinetic energy + gravitational potential energy
 - d. Kinetic energy only.
25. Two spheres of the same diameter, one of mass 5 kg and the other 10 kg, are dropped at the same time from a high tower. When they are 1 meter above the ground, the two spheres have the same
- a. momentum.
 - b. kinetic energy.
 - c. potential energy.
 - d. acceleration.
26. An object of mass 1 kg is pulled along a frictionless horizontal surface. Which of the following statements is not correct?
- a. The kinetic energy of the object does not change.
 - b. The potential energy of the object does not change.
 - c. The object is accelerated.
 - d. Work is done on the object.
27. Brownian motion indicates that
- a. gas particles have spaces between them.
 - b. gas particles are large.
 - c. gas particles give off light.
 - d. gas particles move in all directions.

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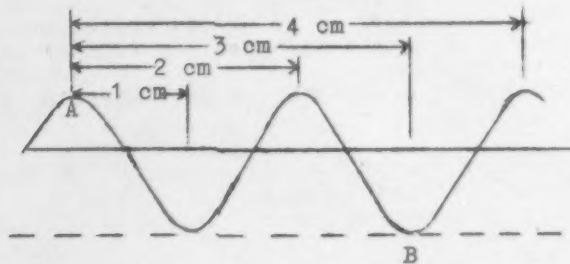
28. There is air inside a tightly closed bottle. What will you do to increase the pressure inside the bottle?
- Place the bottle in a container with ice.
 - Place the bottle in a container with boiling water.
 - Shake the bottle.
 - Leave the bottle in the same place for a few days.
29. Cooking gas is contained in a cylinder. The pressure on the cylinder walls is caused by the gas molecules
- colliding with each other.
 - sticking to the walls.
 - all moving to the top.
 - colliding with the walls.
30. A solid expands when heat is applied.
- Its molecules get larger.
 - Its molecules move farther apart.
 - It begins to melt.
 - The number of molecules increases.
31. To change a solid to a liquid we have to
- give more energy to molecules of the solids.
 - take energy away from molecules of the solids.
 - fill in the spaces between molecules of solid.
 - make the molecules of solid move closer to each other.
32. When the temperature of a substance is increased without change in its phase, which of the following is correct?
- The kinetic energy of its molecules increases.
 - The potential energy of its molecules increases.
 - Both the kinetic and potential energy of molecules increases.
 - Neither the potential energy nor kinetic energy of molecules increases.
33. If the absolute temperature of a gas is doubled, the average kinetic energy of its molecules is
- halved.
 - doubled.
 - increased four times.
 - the same as before.
34. If 1 kg of water at 0°C is mixed with 9 kg of water of 50°C in an insulated container, the resulting temperature of the mixture should be
- 5°C
 - 25°C
 - 40°C
 - 45°C

(OVER)

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35. 27,000 joules are needed to raise the temperature of 3 kg of aluminum by 10°C . What is the specific heat of aluminum in joule/kg $^{\circ}\text{C}$?
- $27,000 \times 3 \times 10$
 - $\frac{27,000}{3 \times 10}$
 - $\frac{27,000}{3} \times 10$
 - $\frac{27,000 \times 3}{10}$
36. A test tube contains 20 g of water at 15°C . Heat applied under the tube raised the temperature of the water to 25°C . The heat absorbed by water is (sp. ht. of water 4,180 joules/kg $\times^{\circ}\text{C}$).
- $4,180 \times .02 \times 10 \text{ J}$
 - $4,180 \times .02 \times 15 \text{ J}$
 - $4,180 \times .02 \times 25 \text{ J}$
 - $4,180 \times 20 \times 10 \text{ J}$
37. Water waves are refracted when they
- pass through a large opening.
 - pass through a small opening.
 - pass from deep to shallow.
 - bounce back after striking a barrier.

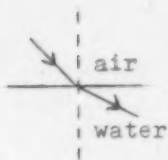
The next two items refer to the figure below which shows a wave in a ripple tank.



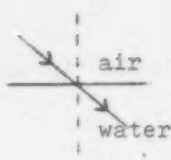
38. The wavelength of the wave is equal to
- 1 cm.
 - 2 cm.
 - 3 cm.
 - 4 cm.
39. If crest A takes 3 seconds to move to position B, what is the frequency of the wave?
- 0.5 hertz
 - 1 hertz
 - 2 hertz
 - 3 hertz

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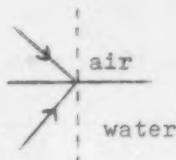
40. Which of the following is transferred from one place to another by a propagating wave?
- time
 - energy
 - mass
 - velocity
41. The diagrams show a ray of light passing from air into water. Which one shows the correct path of the light?



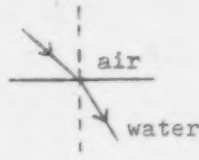
a.



b.



c.



d.

The next three items list the names of scientists who made significant contributions to the study of electromagnetic phenomena. Select the statement below that best describes the contribution of each.

- An electric current exerts a force on a magnet.
 - A changing magnetic field produces an electric current in a wire.
 - A changing electric field produces a magnetic field.
 - Two current-carrying wires exert forces on each other.
42. Maxwell
43. Faraday
44. Ampere
45. Which of the following is a unit of electric potential difference?
- volt
 - ampere
 - ohm
 - coulomb
46. Which one of the following statements is correct?
- Electricity and magnetism are unrelated phenomena.
 - Magnets can produce electric currents and electric currents can produce magnetic fields.
 - Electric currents cannot produce magnetic fields.
 - Electricity and magnetism are identical properties of lodestone.

(OVER)

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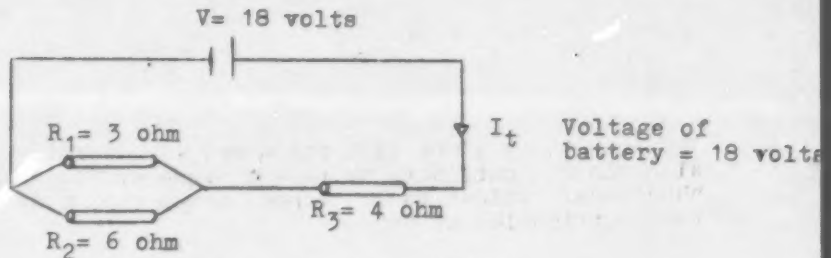
47. Consider the following.

1. a wire loop surrounding a wire with a steady current
2. a magnet dropping through a wire loop.
3. a stationary charged sphere at the center of a wire loop

In which of the above is current produced in the wire loop?

- a. 1 only
- b. 2 only
- c. 3 only
- d. 1, 2 and 3

Numbers 48 to 50 refer to the following electric circuit.



48. The R_1 and R_2 combination is equivalent to

- a. 18 ohms.
- b. 9 ohms.
- c. 6 ohms.
- d. 7 ohms.

49. The total current I_t is equal to

- a. 6 amperes
- b. 3 amperes
- c. $18/13$ amperes
- d. $18/32$ amperes

50. The total resistance of the circuit (R_1 , R_2 and R_3 combination) is equal to

- a. 32 ohms.
- b. 13 ohms.
- c. 6 ohms.
- d. 7 ohms.

(END)

CHEMISTRY

INSTRUCTIONS: For each number, choose the best answer. On your answer sheet, mark the letter corresponding to your choice. If you want to change your answer, erase your first answer and mark your new choice. You have one hour to answer these questions.

1. You are given a mixture of two white compounds. Only one of them is soluble in alcohol. Which series of steps will you follow to get pure samples of each compound?
 - a. Add alcohol, filter and dry.
 - b. Add alcohol, filter and evaporate the liquid.
 - c. Add alcohol, apply heat and filter.
 - d. Add alcohol, apply heat and evaporate the liquid.
2. Which of the following can happen when a radioactive substance disintegrates?
 - a. Valence electrons are lost.
 - b. Electrons are gained.
 - c. Energy is emitted from the nucleus.
 - d. The atom is ionized.
3. Which of the following takes place when a liquid changes to vapor at its boiling temperature?
 - a. The potential energy of the molecules decreases.
 - b. The kinetic energy of the molecules increases.
 - c. The temperature remains constant.
 - d. Heat is given off.
4. Which statement is False?
 - a. Energy is required to remove an electron from a neutral atom.
 - b. Energy is required to move the electron from an s to a px orbital.
 - c. Energy is required to move the electron from a 1s to a 2s orbital.
 - d. Energy is required to move the electron from a px to a py orbital.
5. What happens when a radioactive atom ejects an alpha particle?
 - a. Its electron configuration is unchanged.
 - b. Its atomic number is unchanged.
 - c. Its atomic number decreases.
 - d. Its atomic number increases.

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6. Given:

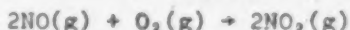
Temperature (°C)	Vapor pressure (torr)	
	Liquid X	Liquid Y
0	4.6	27
25	23.8	94
50	92.5	271

Which statement is correct?

- Liquid X has stronger intermolecular forces than liquid Y.
- As temperature increases, the vapor pressure decreases.
- At 25°C there are more X molecules in the gas phase than Y molecules.
- Liquid Y has stronger intermolecular forces than liquid X.

The following statements refer to items 7-9.

Nitrogen monoxide reacts with oxygen to form nitrogen dioxide.
The equation for the reaction is:



where (g) represents the gas phase.

- How many moles of oxygen are required to react with one mole of nitrogen monoxide?
 - 2
 - $\frac{1}{2}$
 - $\frac{1}{4}$
 - 1
- If 30 nitrogen monoxide molecules come in contact with 30 oxygen molecules, how many nitrogen dioxide molecules are formed?
 - 60
 - 30
 - 45
 - 15
- How many molecules in item 8 would be left over?
 - 10 nitrogen monoxide molecules.
 - 15 oxygen molecules
 - none
 - 15 nitrogen monoxide molecules.
- Given the volume of a definite amount of gas at a given temperature (°K) and a given pressure (atmosphere). What will happen if the temperature is kept constant but the pressure is reduced to $\frac{1}{4}$ of its original value?
 - the volume will remain constant.
 - the volume will be twice its original value.
 - the volume will be $\frac{1}{4}$ of its original value.
 - the volume will be $\frac{1}{4}$ of its original value.

11. The atomic number of nitrogen is 7. What is its electron configuration in the ground state?
 - a. $1s^2 2s^2 2p_x^1 2p_y^1 2p_z^1$
 - b. $1s^2 2s^2 2p_x^2 2p_y^1 2p_z^0$
 - c. $1s^2 2s^0 2p_x^2 2p_y^2 2p_z^1$
 - d. $1s^2 2s^1 2p_x^2 2p_y^2 2p_z^0$
12. Your younger brother is sick and has a temperature of 40°C . Which of the following will give his temperature in degrees Kelvin?
 - a. $273 + 40$
 - b. $273 - 40$
 - c. 273×40
 - d. $273 \div 40$
13. In which of the following processes is energy required?
 - a. separating an electron from an electron.
 - b. separating an electron from a proton.
 - c. separating a negatively charged body from another negatively charged body.
 - d. separating a positively charged body from another positively charged body.
14. Which property is not exhibited by a liquid?
 - a. It has mass.
 - b. It has a definite shape.
 - c. It has a definite volume.
 - d. It exerts pressure.
15. According to the latest findings which of the following is the best model of the atom?
 - a. a sphere containing electrons, protons and neutrons all mixed up.
 - b. a nucleus with electrons orbiting it like planets around the sun.
 - c. a nucleus with electrons moving around it.
 - d. a solid sphere.
16. Two balloons repel each other. Which statement explains this repulsion?
 - a. The balloons have unlike electric charges.
 - b. The balloons are uncharged.
 - c. The balloons have like electric charges.
 - d. Only one balloon is electrically charged.
17. Which substance is produced when a non-metallic oxide reacts with water?
 - a. a gas
 - b. a base
 - c. an acid
 - d. a salt

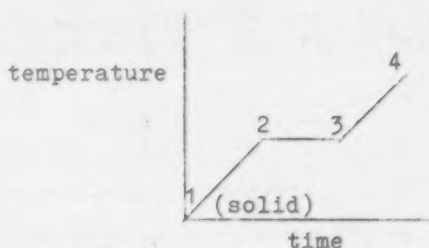
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18. Which of the following statements is correct?

- a. A liquid is a mixture if it is heavier than water.
- b. A liquid is a mixture if it has no definite shape.
- c. A liquid is a mixture if it evaporates easily.
- d. A liquid is a mixture if it has a variable boiling temperature.

Items 19-21 pertain to the following graph which shows the effect of heat on a solid.



19. The warming of the liquified substance is represented by which portion of the graph?

- a. 1 to 2
- b. 2 to 3
- c. 3 to 4
- d. 1 to 3

20. The warming of the solid is represented by which portion of the graph?

- a. 1 to 2
- b. 2 to 3
- c. 3 to 4
- d. 1 to 3

21. Melting takes place at which portion of the graph?

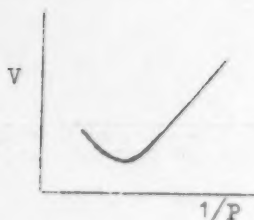
- a. 1 to 2
- b. 2 to 3
- c. 3 to 4
- d. 1 to 3

22. In his atomic theory Dalton suggested that everything was made of atoms. Which of the following is a reasonable basis for his suggestion?

- a. Experiments have shown that many substances are made of tiny round balls.
- b. The idea of atoms helped him to explain many observations.
- c. He could see that sand, sugar, and other substances were made of atoms.
- d. When things burn, they leave black substances.

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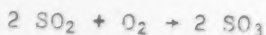
23.



The graph above shows the effect of pressure on the volume of a gas at constant temperature. Which is the best interpretation for the curve?

- In all cases the volume is directly proportional to all pressure.
- In all cases the volume is inversely proportional to the pressure.
- At extremely high pressures, the direct relationship of volume to pressure does not hold.
- At extremely high pressures, the inverse relationship of volume to pressure does not hold.

24. Given that



What mass of SO_2 would react with 32 g of O_2 ?

Atomic masses: O = 16, S = 32

- | | |
|---------|----------|
| a. 32 g | c. 96 g |
| b. 64 g | d. 128 g |

25. Choose the correct statement for the reaction



- Zinc gains two electrons.
- The hydrogen ion is the oxidizing agent.
- The sulfur atom in sulfuric acid is the oxidizing agent.
- Hydrogen gas is the reducing agent.

26. What volume of Hydrogen gas at standard temperature and pressure will be produced from sulfuric acid and 0.05 mole of zinc metal?

- | | |
|----------------|----------------|
| a. 4.48 liters | c. 1.12 liters |
| b. 2.24 liters | d. 22.4 liters |

(OVER)

- a. 142 c. 152
b. 47 d. 121

- Atomic masses: $\text{C} = 14, \text{O} = 16$

- a. $\text{H}_2\text{O}(l) \rightarrow \text{H}_2\text{O}(g)$
b. $\text{H}_2\text{O}(s) \rightarrow \text{H}_2\text{O}(l)$
c. $2 \text{H}_2\text{O}(l) \rightarrow \text{H}_2(g) + \text{O}_2(g)$
d. $\text{H}_2(g) + \text{O}_2(g) \rightarrow 2 \text{H}_2\text{O}(l)$

- a. no change in energy.
- b. a change in density.
- c. a change in mass.
- d. a change in composition.

- a. $5 \times \frac{100}{27} \times \frac{3}{2}$ c. $5 \times \frac{300}{373} \times \frac{2}{3}$
b. $5 \times \frac{373}{300} \times \frac{3}{2}$ d. $5 \times \frac{27}{100} \times \frac{2}{3}$

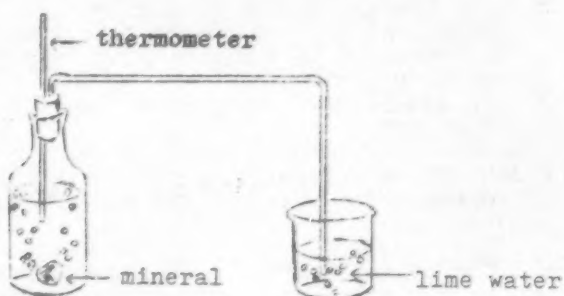
- $\text{H}_2\text{O}(l) \rightarrow \text{H}_2\text{O}(g)$
- $\text{H}_2\text{O}(s) \rightarrow \text{H}_2\text{O}(l)$
- $2\text{H}_2\text{O}(l) \rightarrow 2\text{H}_2(g) + \text{O}_2(g)$
- $\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(l)$

- a. number of protons.
- b. number of electrons
- c. atomic mass
- d. atomic number

34. Which of the following will show the presence of an acid?
- glowing splinter
 - lime water
 - litmus paper
 - application of heat
35. When heat is applied to a white, crystalline solid, a gas and a black solid are formed. Which of the following terms represents the white, crystalline solid?
- element
 - precipitate
 - solution
 - compound
36. Which of the following is not homogeneous?
- alcohol
 - oil
 - syrup
 - soup

Questions 37 - 41 refer to the following experiment.

A piece of mineral is placed in a bottle half-filled with a colorless liquid. A two-holed rubber stopper is placed in the bottle. This stopper contains a thermometer and a glass tubing connecting the bottle and a beaker of lime water.



Observations during the first few minutes.

- Bubbles of a colorless gas rise to the top of the bottle from the mineral.
- Bubbles of colorless gas begin to come out of the glass tubing and rise to the surface of the lime water.
- The lime water remains clear.
- The thermometer reads 20°C , which is also the room temperature.

Observations at the end of thirty minutes.

- Bubbles of colorless gas continue to rise in the bottle.
- The piece of mineral has become smaller.
- There is no change in the level of the colorless liquid in the bottle.
- The liquid in the bottle remains colorless.
- The thermometer read 24°C .
- The lime water is cloudy.

37. Based on the observations which of the following hypotheses is most reasonable?
- the mineral is not composed of any of the elements contained in lime water.
 - the mineral is readily soluble in water.
 - the mineral is undergoing a phase change in which energy is released.
 - the mineral is undergoing a chemical reaction with the colorless liquid.
38. What is the most probable explanation of the fact that the lime water remained clear during the first few minutes?
- The bubbles of gas coming from the tube during the first few minutes were air bubbles.
 - The composition of the gas given off by the mineral changed as the experiment progressed.
 - The temperature of the lime water was too low during the first few minutes.
 - The composition of the colorless liquid changed as the experiment progressed.
39. Which of the following involves an interpretation of the data rather than an observed fact?
- The cloudiness in the beaker was caused by the product of the reaction of the colorless gas and lime water.
 - The bubbles of gas rising from the mineral remained colorless throughout the experiment.
 - There was a four degree rise in temperature at the end of thirty minutes.
 - No liquid was transferred from the reaction bottle to the beaker.
40. Which of the following is the best explanation for the appearance of bubbles at the end of the tube in the beaker of lime water?
- The pressure exerted by the colorless liquid is greater than that exerted by the lime water.
 - The temperature increase at the end of thirty minutes causes an expansion of gas in the stoppered bottle.
 - The bubbles coming from the mineral cause an increased gas pressure in the stoppered bottle.
 - The level of the glass tube in the bottle is above the level of the tube in the beaker.
41. Which of the following can reasonably cause the temperature increase observed at the end of thirty minutes?
- Energy resulting from the reaction between the mineral and the colorless liquid.
 - Energy resulting from the heat of vaporization of the mineral.
 - Energy resulting from the heat of fusion of the mineral.
 - Energy resulting from the reaction between the lime water and the gas bubbles.

42.

Electron Configuration

main energy levels		1	2		3		
subenergy levels		s	s	p	s	p	d
Atom	1	2	2	6	1		
	2	2	2	6			
	3	2	2	5			
	4	2	2	6	2	6	

Which atom is a metal?

- a. atom 1
- b. atom 2
- c. atom 3
- d. atom 4

43. The ionization energy is the energy involved in which of the following processes?

- a. $\text{Na(s)} \rightarrow \text{Na(g)}$
- b. $\text{Na(l)} \rightarrow \text{Na(g)}$
- c. $\text{Na(g)} + \text{e}^- \rightarrow \text{Na}^-(\text{g})$
- d. $\text{Na(g)} \rightarrow \text{Na}^+(\text{g}) + \text{e}^-$

In the equations, (g) represents the gas phase, (l) the liquid phase, and (s) the solid phase.

44. Where in a given period of the periodic table do you find atoms having the greatest electronegativity?

- a. top
- b. bottom
- c. left side
- d. right side

45. The formula for magnesium oxide is MgO and for magnesium chloride is MgCl_2 . From this information and the periodic table, which of the following does not have the same number of electrons as the magnesium ion?

- a. calcium ion, Ca^{+2}
- b. neon atom, Ne
- c. fluoride ion, F^-
- d. oxide ion, O^{-2}

(OVER)

46. Which process will form a negative ion from a neutral atom?
- gain of electrons
 - gain of protons
 - gain of atoms
 - gain of neutrons
47. Which compound is covalent?
- barium chloride (BaCl_2)
 - ammonia (NH_3)
 - lithium fluoride (LiF)
 - copper sulfate pentahydrate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$)
48. Which of the following molecules has a dipole moment?
- nitrogen (N_2)
 - methane (CH_4)
 - carbon tetrachloride (CCl_4)
 - ammonia (NH_3)
49. Which statement best describes an oxidation-reduction reaction?
- The number of electrons gained by the oxidizing agent equals the number lost by the reducing agent.
 - The atoms involved undergo a change in oxidation number.
 - The oxidizing agent loses electrons while the reducing agent gains electrons.
 - The oxidizing agent undergoes an increase in oxidation number while the reducing agent undergoes a decrease in oxidation number.
50. The compound ethane, C_2H_6 , is a constituent of cooking gas. When completely burned, it produces carbon dioxide and water. Choose the correct equation for this reaction.
- $2 \text{C}_2\text{H}_6 + 5 \text{O}_2 \rightarrow 4 \text{CO} + 6 \text{H}_2\text{O}$
 - $\text{C}_2\text{H}_6 + 7 \text{O}_2 \rightarrow 2 \text{CO}_2 + 3 \text{H}_2\text{O}$
 - $2 \text{C}_2\text{H}_6 + 7 \text{O}_2 \rightarrow 4 \text{CO}_2 + 6 \text{H}_2\text{O}$
 - $\text{C}_2\text{H}_6 + 5 \text{O} \rightarrow 2 \text{CO} + 3 \text{H}_2\text{O}$

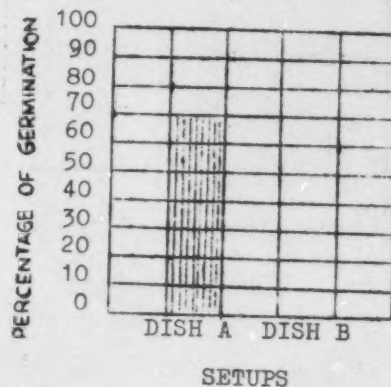
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BIOLOGY

INSTRUCTIONS: For each number, choose the best answer. On your answer sheet, mark the letter corresponding to your choice. If you want to change your answer, erase your first answer and mark your new choice. You have one hour to answer these questions.

Item 1-3 refer to the following experiment: 0

Group I in the biology class of Mrs. Santos presented their data obtained in the seed germination experiment. The setups used were: Setup A contained 10 bean seeds placed in a petri dish lined with moist blotting paper. Setup B contained 10 bean seeds kept in a petri dish lined with dry blotting paper. Both setups were set aside on a table near the window where they received light. The result of the experiment is presented in a bar graph below.



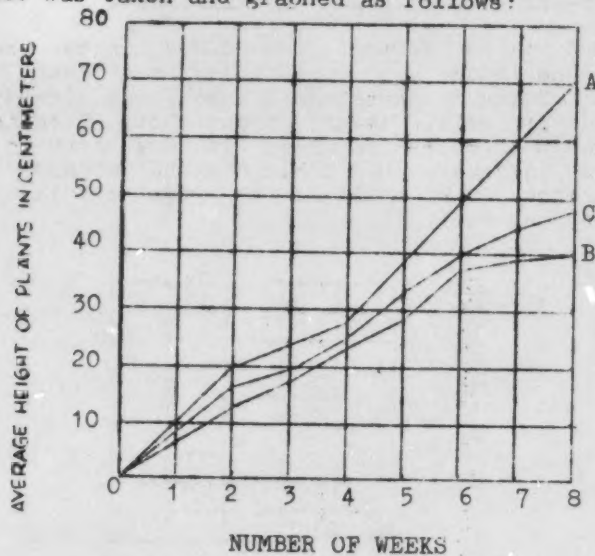
- The best interpretation one can give on this bar graph is:
 - light is needed in germination.
 - same kind of blotting paper is needed in germination.
 - moisture is needed for germination.
 - bean seeds do not germinate in petri dishes.
- What is the importance of Dish B?
 - it is an experimental setup
 - it is a control setup
 - it is of no use
 - it is a duplicate of Dish A
- The factor investigated in this experiment was:
 - moisture or water is needed in bean seed germination.
 - light is not needed in germination of bean seeds.
 - light and moisture are needed in the germination of bean seeds.
 - light alone causes germination of bean seeds.

(OVER)

- 2 -

Items 4-6 refer to the problem below:

A group of biology students experimented on the effectivity of a certain type of plant fertilizer. Plots A, B and C were planted with rice seedlings. Plot A was treated with 10 grams of the fertilizer while Plot B with 50 grams. Plot C was not treated at all. For 8 weeks, the average height of the plants in each plot was taken and graphed as follows:



4. Based on the graph, what possible generalization can you make regarding the effectivity of the fertilizer?
 - a. Rice plants grow faster with higher dosage of fertilizer.
 - b. The fertilizer is best effective at a dose of 10 grams per plot.
 - c. Any amount of fertilizer used has no effect on the rice plants.
 - d. Rice plants grow best without the fertilizer.
5. Which of the following was the variable in the experiment?
 - a. the type of fertilizer used
 - b. the amount of fertilizer used
 - c. the kind of plants used
 - d. the number of days of experiment
6. If you wanted to find out further the effectivity of the fertilizer, which of the following should you consider?
 - a. number of leaves
 - b. amount of palay grains harvested
 - c. character of the seeds produced by the plant
 - d. all of the above

7. In 1665 a scientist used a crude microscope and described the parts of the cell consisting of a cell wall, nucleus and protoplasm. Now, the scientist sees more parts of a cell with a powerful microscope. This means that:
 - a. the findings of the scientist in 1665 are still correct and should not be changed.
 - b. scientific findings improve as more precise instruments are used.
 - c. the cell in 1665 is different from the cell of today
 - d. first findings are always correct.
8. A scientist from the United States found a possible cure for cancer. One year later a Japanese scientist found the same result. This illustrates that:
 - a. scientific investigations can be repeated under different conditions.
 - b. performing similar scientific investigation is a waste of time, effort and money.
 - c. USA scientists will always be number one in scientific investigations.
 - d. The Japanese scientist should not have experimented on the same problem.
9. The results you obtained in an experiment differed from those of your groupmates. Which of the following steps would you do?
 - a. Repeat the activity very carefully then compare your results with your classmates.
 - b. Set aside your results and copy those of your classmates.
 - c. Ask for the correct data from the teacher.
 - d. Make changes in your results so they will be similar to the results obtained by your classmates.
10. Choose one statement that best illustrates irritability among living things.
 - a. swaying of bamboo when the wind blows.
 - b. development of a tadpole into a frog.
 - c. coiling of a millepede when touched with a stick.
 - d. chicken scratching the ground for food.
11. The meaning of birth rate is best illustrated by the following statement:
 - a. Jose Rizal's birthday is on June 19.
 - b. Siamese twins are born once in 20 years.
 - c. one hundred chicken eggs hatched yesterday.
 - d. mongo seeds germinate easily.
12. Wind dispersal of seeds is best illustrated by which of the following?
 - a. guava
 - b. talahib
 - c. papaya
 - d. coconut

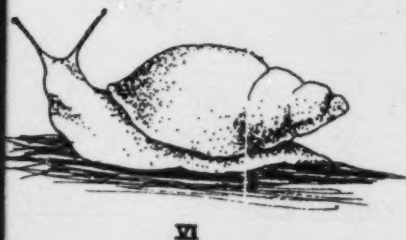
(OVER)

13. A biology student was given a culture dish containing one type of bacteria. He was asked to classify the bacteria according to shape. Which of the following procedures should he do in the laboratory?
- analyze the waste materials produced by the bacteria in the culture dish.
 - study the behavior of the bacteria both in the natural habitat and in the laboratory.
 - make a thin smear on a glass slide and stain for microscopic examination.
 - determine the substances in which the bacteria will grow.
14. Of the following characteristics which does not describe a virus?
- It can reproduce.
 - It can undergo changes in hereditary characteristics.
 - It can be crystallized and stored.
 - It contains chlorophyll.
15. What is the largest group in which a living organism could be placed in?
- Kingdom
 - Phylum
 - Family
 - Genus
16. Classification of living things is basically determined by
- similarities in structure only.
 - differences in structure only.
 - place where organisms live together.
 - similarities and differences in structure of organisms.
17. Which statement does not characterize a dicot plant?
- generally netted leaf venation
 - with two cotyledons
 - vascular bundles arranged in a ring encircling the pitch
 - grows from 1 m to 2 m tall only

Items 18-20 refer to the organisms listed below. These organisms can be classified in several different ways by using different features as the basis for classification.

- I. Mushroom
- II. Moss
- III. Corn Plant
- IV. Bangus

- V. Planaria
- VI. Snail
- VII. Bat



(OVER)

18. Which of the following pairs of organisms can manufacture their own food?
- a. I, IV
 - b. II, III
 - c. IV, VI
 - d. I, V
19. Which of the following pairs of organisms possess a backbone?
- a. IV, VII
 - b. V, III
 - c. IV, VI
 - d. I, II
20. Organisms I, II and III belong to a big group known as
- a. Animal Kingdom
 - b. Plant Kingdom
 - c. Protist Kingdom
 - d. Phylum Tracheophyta
21. A taxonomist found a gumamela plant in a remote place. He described it as a new species. The characteristic most suitable to distinguish it from other species is the
- a. leaf size
 - b. plant size
 - c. type of soil where it grows
 - d. structure of flower
22. Alicia saw a slow-moving organism under the microscope. She would like to study the detailed structure of the organism. What part of the microscope should she move?
- a. Low power objective and fine adjustment knob
 - b. High power objective and coarse adjustment knob
 - c. Low power objective and coarse adjustment knob
 - d. High power objective and fine adjustment knob
23. How does a biologist view the modern method of classification?
- a. The method of classification has been established since 1753 by Carl von Linne, hence it should not be changed.
 - b. It is an artificially man-made system of grouping and naming organisms based on structures used by biologists in order to conveniently handle information about living organisms.
 - c. Before an organism appears on earth there is already a scheme of classification for it.
 - d. This system of classification eliminates other organisms from the group based on their habitat.
24. A species is a group of similar organisms that
- a. live in the same geographic location.
 - b. eat the same kind of food.
 - c. can mate and produce fertile offspring.
 - d. can easily disappear.

25. Which of the following best describes organic evolution?
- Evolution is the development of an organism from the primitive form to the present form over a period of time.
 - Evolution is variation that occurs in every generation of the organism.
 - Evolution is a proof that man is the superior animal.
 - Evolution is change in the environment.
26. All of the following statements, except one, serve as evidence in support of the theory of evolution. Which one is not an evidence?
- Organisms preserved as fossils differ from presently existing organisms.
 - Some animals possess organs which have no useful purpose.
 - The structure of organisms did not change through the years.
 - The organisms that survive are best adapted to live in the environment.
27. The rigid structure of most plant cells is mainly attributed to the:
- accumulation of food in the cell walls.
 - presence of a cell wall.
 - abundance of chloroplasts in the leaf cells.
 - presence of vacuoles in the cytoplasm.
28. Mitotic cell division in the onion root cell results in:
- four daughter cells with haploid number of chromosomes.
 - two daughter cells each having the same chromosome number as the mother cell.
 - four daughter cells each having the original number of chromosomes as the mother cell.
 - two daughter cells each having half the original number of chromosomes as the mother cell.
29. In man, meiosis occurs in the
- egg cell of the female and sperm cell of the male, separately.
 - egg cell of the female only.
 - sperm cell only.
 - egg cell of the female whenever fertilization occurs.
30. The enzyme that digests starch is secreted by the:
- salivary gland.
 - gall bladder
 - pancreas.
 - large intestine.
31. Green plants make food from carbon dioxide (CO_2) in the atmosphere in the presence of sunlight. Green plants submerged in water.
- use CO_2 dissolved in water.
 - use only CO_2 which they manufacture themselves.
 - make food without CO_2 .
 - use only food produced by other organisms.

(OVER)

Items 32-34 refer to certain processes. Which organism would most likely carry on the process of:

32. pollination?

- | | |
|------------|---------|
| a. Euglena | c. Moss |
| b. Fern | d. Rose |

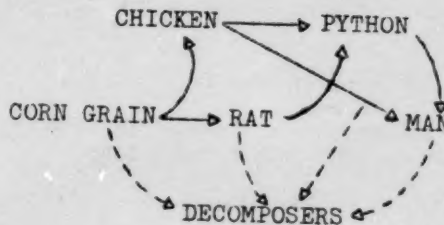
33. metamorphosis?

- | | |
|-----------|------------|
| a. beetle | c. reptile |
| b. fish | d. amoeba |

34. external fertilization?

- | | |
|-------------|----------|
| a. kangaroo | c. whale |
| b. dalag | d. owl |

Questions 35-36 relate to the following diagram of a food web.



35. Which arrangement represents a correct food chain within this food web?

- corn grain + man + python + chicken
- corn grain + rat + python + man
- corn grain + chicken + rat + man
- chicken + python + man + rat

36. The diagram shows that man can be a:

- first-order, second-order and third-order consumer.
- producer, a first-order and second-order consumer.
- first-order and second-order consumer only.
- second-order, third-order and fourth-order consumer.

Questions 37-40. For each of the following, choose the letter that describes the item in numbers 37-40. You may use each letter more than once.

- it is a raw material in photosynthesis
- it is a product of photosynthesis
- it is required in photosynthesis but not as a raw material

37. Light energy

38. Water

- 9 -

39. Oxygen

40. Carbon dioxide

Numbers 41-43 are about the branches of biology. Under Column I are statements which describe what some scientists do. Choose the letter of the branch of biology under Column II that fits each statement given in Column I.

- | Column I | Column II |
|--|---|
| 41. Prof. Guzman studies fossil remains of organisms and correlates them with the geologic period. He is a _____. | a. Taxonomist
b. Physiologist
c. Embryologist
d. Paleontologist |
| 42. Carl von Linne was the first to group, classify and give names to organisms. A biologist who continues his work is known as _____. | |
| 43. In one research a biology professor dissected a rabbit. He studied its reproductive structure and he injected a certain substance to find out if the function of the reproductive organ will be affected. One who is engaged in a study of this kind is _____. | |
| 44. Some farmers practice rotation of crops by planting upland rice or corn one season, then mango or sitao the next season. What is the most probable reason behind this practice? | a. to regulate the amount of moisture in the soil
b. to replace the lost nitrates in the soil
c. to have a variety of crops for the market
d. to prevent soil erosion. |
| 45. The water required by a land plant is taken in: | a. by the leaves from the water vapor always present in the air.
b. by the roots of the plant.
c. about equally by the roots and leaves of the plant.
d. by the bark of the plant. |

(OVER)

Items 46-48. Below is a Punnet square which represents possible inheritance in dihybrid crosses where black (B) is dominant to white (b) and straight hair (S) is dominant to curly hair (s). The organisms are represented by a letter inside the box.

	BS	Bs	bS	bs
BS	A	C	E	G
Bs	I	K	M	O
bS	Q	R	T	U
bs	V	W	X	Y

46. The genotype of organism C is
- BBSS
 - BBss
 - BbSS
 - bbSS
47. The phenotype of organism U is
- black, straight hair.
 - black, curly hair.
 - white, straight hair.
 - just like organism G.
48. Which organism will show both recessive traits?
- Organism O
 - Organism Y
 - Organism U
 - Organism A

- 11 -

Questions 49-50 refer to the experiment below:

Some foods were tested for nutrients that they contain. The test revealed the following:

Food-tested	Iodine Test	Spot Test
Sinkamas	-	-
pan de sal	+++	-
longanisa	-	+++
Boiled banana (saba)	++	-
Roasted casoy seeds	-	+

49. Based on the above results one can say that pan de sal and boiled banana (saba) are foods rich in
- sugar.
 - carbohydrates.
 - protein.
 - vitamins.
50. The spot test revealed that longanisa and roasted casoy nuts contain
- fats.
 - protein.
 - minerals.
 - sugar.

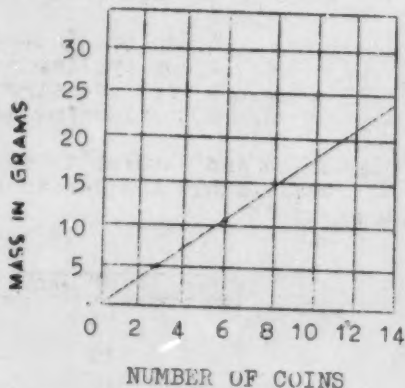
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GENERAL SCIENCE

INSTRUCTIONS: For each number, choose the best answer. On your answer sheet, mark the letter corresponding to your choice. If you want to change your answer, erase your first answer and mark your new choice. You have one hour to answer these questions.

1. A graph of mass versus number of coins is shown below. What is the mass of 8 coins in grams?

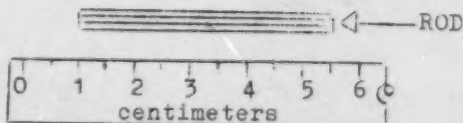
- a. 8
- b. 10
- c. 13
- d. 15



2. Item 2 refers to the diagram below.

The length of the rod is

- a. 4.0 centimeters
- b. 4.5 centimeters
- c. 5.0 centimeters
- d. 5.5 centimeters



3. If a certain force is exerted on an object, the shape of the object changes. Based on this statement, the operational definition of force is
- a. Force makes objects move.
 - b. Force is the amount of effort exerted.
 - c. Force is a push or a pull.
 - d. Force can cause change in the shape of an object.
4. Which of the following is true if there is no friction in a system?
- a. Output is greater than input.
 - b. Input is greater than output.
 - c. Input is equal to output.
 - d. None of the above.
5. From the chemical formula H_2O_2 , we can conclude that
- a. the compound is water.
 - b. there are two molecules of the compound.
 - c. the compound is a liquid.
 - d. each element in the compound has equal number of atoms.

(OVER)

- 2 -

6. Diffusion is faster in a gas than in solids and liquids because

- a. gas particles have more freedom of movement.
- b. gas particles are in constant motion.
- c. gas particles have no definite volume.
- d. gas particles are smaller.

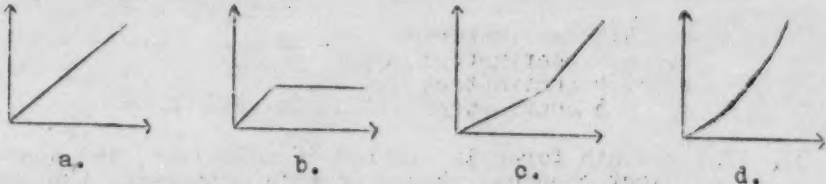
7. Which condition operationally defines work?

- a. A man pushing against a concrete wall.
- b. A boy pulling a moving cart.
- c. A girl standing and holding a bag.
- d. A boy leaning against a tree.

Numbers 8 and 9 refer to the table and diagram below.
The table shows the length a spring stretches when washers are hung on it.

Number of washers	Length Spring Stretches
0	0 cm
5	2 cm
10	4 cm
15	6 cm
20	8 cm

8. Which of the following graphs illustrates the data given in the table?



9. If 20 more washers are added to the spring, how many centimeters will the spring stretch?

- a. 14
- b. 16
- c. 18
- d. 20

10. 100 g of water was heated for 2 minutes. The temperature of the water became 25°C higher. What would be the change in temperature if 50 g of water were heated under the same conditions for 2 minutes?

- a. 12.5°C
- b. 25°C
- c. 50°C
- d. 75°C

11. Which of the following is a standard unit of measuring heat?

- a. Temperature
- b. Degree
- c. Calorie
- d. Celsius

- 3 -

12. Beakers A and B contain the same amount of water. The temperature of the water in A is 90°C while the water in B is 50°C . According to the energy-particle model for matter, we can say that on the average, the particles of water in A are
- moving slower than those in B.
 - moving faster than those in B.
 - smaller than those in B.
 - larger than those in B.
13. The heat-as-a-substance model claims that heat is a substance being added to materials that are heated. This model is no longer accepted because it could not explain
- why there is no increase in the mass of objects when heat is applied.
 - why heat is lost to the surroundings.
 - the expansion of materials when heat is applied.
 - the heat transfer from warm to cold objects.
14. The thermometer works on the principle that
- substances absorb heat.
 - substances expand when they absorb heat.
 - substances have different heat capacities.
 - substances differ in their ability to absorb heat.
15. Which of the examples below shows a physical change?
- Decay of fruits
 - Explosion of gunpowder
 - Rusting of iron
 - Cutting of wood
16. Two objects, A and B, are in contact with each other. Heat will flow from A to B if
- A has a higher temperature than B.
 - A has greater mass than B.
 - A has greater volume than B.
 - A has greater heat capacity than B.
17. What happens to the mass and the weight of an object when brought from the earth to the moon?
- Both mass and weight decrease.
 - Both mass and weight increase.
 - The mass decreases while the weight remains the same.
 - The mass remains the same while the weight decreases.
18. In which phase of matter do molecules have the least attraction for one another?
- solid
 - liquid
 - gas
 - it is the same for all phases

(OVER)

19. A cube of aluminum has a volume of 10 cubic centimeters and a mass of 270 grams. What is the density in g/cm^3 ?
- 2.7
 - 27.0
 - 270
 - 0.27
20. When two clear solutions are mixed and a colored solid is produced, you know that
- a chemical reaction has taken place.
 - heat is produced.
 - atoms have been produced.
 - atoms have been destroyed.
21. Pedro has samples of 21 different elements. How many different kinds of atoms does Pedro have?
- 6 or 7
 - 21
 - 42
 - cannot tell, data is not enough.
22. Each different shape in the diagrams below represents a different kind of atom. Which diagram represents an element?
- 

a.



b.



c.

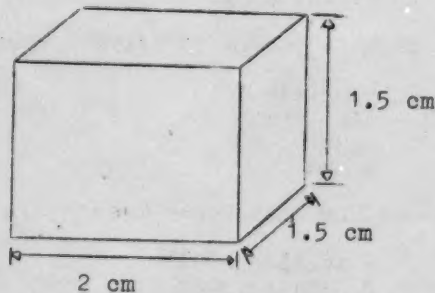


d.
23. Salt (sodium chloride) dissolved in water exists in the form of
- atoms
 - ions
 - molecules
 - compounds
24. Which of the following substances is an element?
- wood
 - iron
 - rock
 - water
25. The chemical formula of hydrogen peroxide is H_2O_2 . How many atoms are there in one molecule of hydrogen peroxide?
- 2
 - 3
 - 4
 - 5

26. The formula of carbon dioxide is CO_2 . How many kinds of atoms compose carbon dioxide?
- 1
 - 2
 - 3
 - 4
27. A system consists of a black powder and a colorless liquid. When the black powder and the liquid combine, which of the following observations indicate that a chemical reaction took place between the substances?
- The powder dissolved in the liquid.
 - The temperature of the system increased.
 - The mass of the system increased.
 - The density of the system increased.
28. An odorless gas added to limewater makes the limewater cloudy. The gas does not burn. This gas might be
- hydrogen.
 - carbon dioxide.
 - nitrogen.
 - oxygen.
29. If a cart rolls down an inclined plane which of the following is true?
- Potential energy of the cart decreases.
 - Kinetic energy of the cart decreases.
 - Potential energy of the cart increases.
 - Kinetic energy of the cart remains the same.
30. The kinetic energy of a body depends on
- mass and height.
 - speed and height.
 - mass and speed.
 - speed only.
31. The potential energy of a body depends on
- weight and height.
 - speed and height.
 - height only.
 - weight only.
32. What form of energy is stored in a battery?
- electrical
 - chemical
 - light
 - sound
33. Which of the following has kinetic energy?
- a rolling ball
 - a hanging rock
 - a ball resting on a table
 - a rock on the ground

(OVER)

34. Scientists use the heat-as-energy model because it
- provides correct answers to all questions about heat.
 - describes the actual nature of heat.
 - helps explain observations and predict other observations.
 - is the only true model for heat, and scientists have found it.
35. When some observations in a certain area of science cannot be explained by an existing scientific model, scientists should
- completely disregard the model.
 - disregard the observations.
 - modify the observations to suit the model.
 - modify the model so that it could explain new observations.
36. The quantity which is changed in an experiment and affects the results is called
- hypothesis.
 - control.
 - variable.
 - conclusion.
37. Which of the following is the correct unit of density?
- gram/square centimeter
 - gram x centimeter
 - gram/cubic centimeter
 - gram x cubic centimeter
38. In which form do water molecules have the greatest kinetic energy?
- solid as ice
 - liquid as water
 - gas as water vapor
 - the same for all
39. What is the volume in cm^3 of the block shown below. Its length, width, and thickness are given.

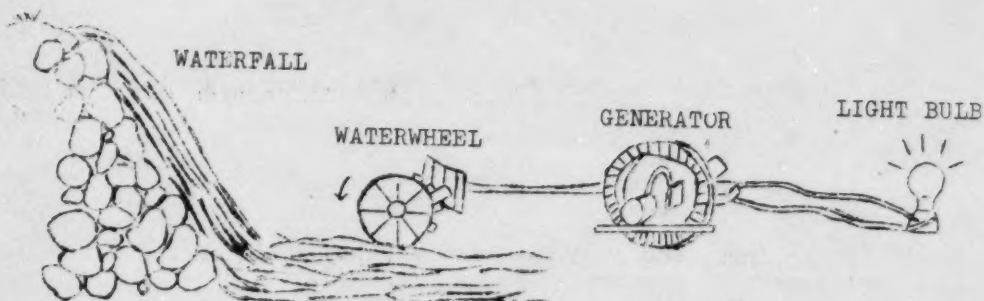


- 5.0
- 4.5
- 4.0
- 3.5

- 7 -

40. An object is inside a covered box. Which observation below would tell something about the shape of the object?
- It rolls.
 - It feels heavy.
 - It smells sweet.
 - It has a metallic sound.
41. Work is defined as force multiplied by distance. Which of the following is the correct unit of work?
- kilogram x meter
 - kilogram/meter
 - newton/meter
 - newton x meter

Numbers 42 and 43 refer to the diagram below.

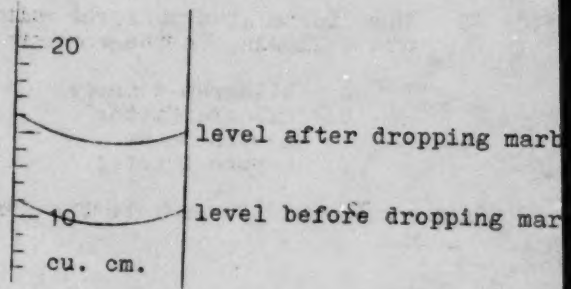


42. What are the changes in the forms of energy?
- gravitational potential → mechanical → electrical → light
 - gravitational potential → electrical → mechanical → light
 - mechanical → electrical → heat → light
 - gravitational potential → electrical → heat → light
43. In the example above, which is the energy supplier?
- waterfall
 - water wheel
 - generator
 - light bulb
44. Which statement below explains the observation that the density of gases is less than the density of liquids?
- Molecules of gases are smaller than molecules of liquids.
 - Molecules of liquids are heavier than molecules of gases.
 - Molecules of gases are farther apart than those of liquids.
 - Molecules of gases move slower than those of liquids.

(OVER)

45. A marble is dropped in a graduated cylinder with water. The illustration below shows the level of water before and after dropping the marble. What is the volume of the marble in cm^3 ?

- a. 5
- b. 10
- c. 15
- d. 20

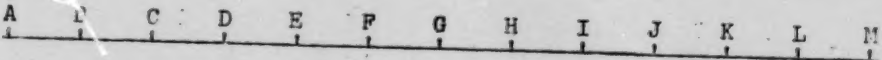


46. How long does it take for the earth to go around the sun once?
- a. one day
 - b. one week
 - c. one month
 - d. one year
47. In science, one is least likely to do which of the following things with a mango?
- a. Determine its weight.
 - b. Write a poem about it.
 - c. Describe its color.
 - d. Determine its volume.
48. Light travels
- a. a little slower than sound.
 - b. at about the same speed as sound.
 - c. a little faster than sound.
 - d. much faster than sound.
49. What is air made of?
- a. mainly oxygen
 - b. only nitrogen and oxygen
 - c. mainly carbon dioxide and oxygen
 - d. many different gases.
50. Which of the examples below shows a chemical change?
- a. Alcohol changes to vinegar.
 - b. Water changes to ice.
 - c. Sugar dissolves in water.
 - d. Sea water evaporates and produces salt.

(END)

PLANE GEOMETRY ACHIEVEMENT TEST

INSTRUCTIONS: For each number, choose the best answer. On your answer sheet, mark the letter corresponding to your choice. If you want to change your answer, erase your first answer and mark your new choice. You have one hour to answer these questions.

1. Which of the following can always be stated as an if and only if statement?
 - a. postulates
 - b. theorems
 - c. definitions
 - d. none of these
2. The length of one of the following geometric figures can be measured. Which is it?
 - a. line
 - b. ray
 - c. line segment
 - d. number line
3. Which of the statements below means the same as
All girls who have long hair are pretty.
 - a. If a girl has long hair then she is pretty.
 - b. If a girl is pretty then she has long hair.
 - c. If a person is a girl then she has long hair.
 - d. If a person is a girl then she is pretty.
4. The statement,
If a is a b then a is a c.
means the same as
 - a. All a's are c's.
 - b. All a's are b's.
 - c. All c's are b's.
 - d. All b's are c's.
5. In the figure below, the points are plotted at equal intervals.
 

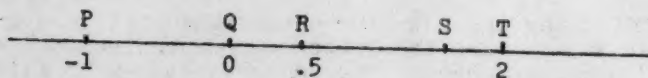
If $\overline{AD}$ is the unit distance, the distance between A and M is

 - a. 13 units.
 - b. 12 units.
 - c. 4 units.
 - d. 3 and $\frac{1}{4}$ units.
6. On the number line the distance between -2 and 2 is
 - a. 0 units.
 - b. 2 units.
 - c. 4 units.
 - d. 8 units.
7. L, M and N are three points of a line. The coordinates of L and M are 4 and -3 respectively. If M is between L and N and $|LN| = 11$, what is the coordinate of N?
 - a. 13
 - b. -13
 - c. 7
 - d. -7

(OVER)

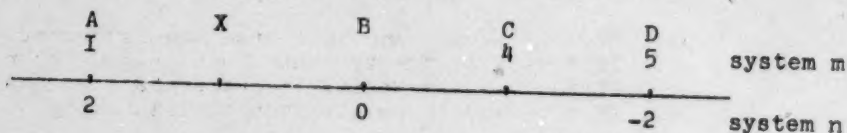
- 2 -

8. The figure below shows a coordinate system on a line.



The coordinate of point S

- is less than 1.
 - is 1.
 - is greater than 1.
 - cannot be approximated.
9. In the coordinate system of problem 8, ray $\overrightarrow{QT}$ is the set of points whose coordinates, x , satisfy
- $x > 0$
 - $x < 0$
 - $x \geq 2$
 - $x \leq 2$
10. Two coordinate systems m and n , assign coordinates to points on a line as shown below.

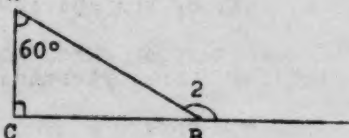


If the points are equally spaced then

- the coordinate of X on both systems is the same.
 - the coordinate of X on system m is 0.
 - the coordinate of X on system n is -1.
 - the coordinate of X on system n is 1.
11. If A is between B and C and C is between B and D then
- A is between C and D.
 - B is between A and C.
 - C is between A and D.
 - D is between B and C.
12. A, B and C are on the same line. Then
- B is between A and C.
 - A is between B and C.
 - C is between A and B.
 - cannot tell.
13. Points A, B, C lie on a line. If $|AC| > |AB|$ which of the following cannot happen?
- A is between B and C.
 - B is between A and C.
 - C is between A and B.
 - $|AB| = |BC|$

14. Given a line, which of the following statements is always true?
- (1) There is a point not on the line.
 - (2) There are an infinite number of points on the line.
 - (3) There is a plane on which it lies.
- a. (1) only
 - b. (2) only
 - c. (1) and (2) only
 - d. all of the above.
15. Which of the following determine a plane?
- (1) three noncollinear points
 - (2) two perpendicular lines
 - (3) three intersecting lines
- a. (1) only
 - b. (2) only
 - c. (1) and (2) only
 - d. all of the above.
16. Let A, B and C be three noncollinear points. How many lines containing B are determined by these three points?
- a. one only
 - b. two only
 - c. three only
 - d. an infinite number
17. Abel, Ben and Carlos are on the volleyball court. If Abel and Ben are on opposite sides of the net and Ben and Carlos are on opposite sides of the net then Abel and Carlos would be
- a. on the same side of the net.
 - b. on opposite sides of the net.
 - c. on both ends of the net.
 - d. under the net.
18. Given the two sentences
- (1) Line m is perpendicular to line n.
 - (2) Lines m and n intersect.
- which of the following conditional statements below is (are) always true?
- a. If (1) then (2); and if (2), then (1).
 - b. If (1), then (2) only.
 - c. If (2), then (1) only.
 - d. Neither (1) nor (2) implies the other.
19. Two lines are perpendicular to the same line. The lines
- a. are perpendicular to each other.
 - b. do not intersect but lie on the same plane.
 - c. do not intersect and do not lie on the same plane.
 - d. the relationship between the two lines cannot be determined.

(OVER)

20. The two acute angles of a right triangle are:
- supplementary.
 - complementary.
 - equal.
 - none of the above.
21. If a person is a mathematician and works with a computer then he can add. Jose can add. Which of the following can we conclude about Jose?
- Then Jose is a mathematician.
 - Then Jose works with a computer.
- (1) only
 - (2) only
 - (1) and (2)
 - neither (1) nor (2)
22. In right triangle ACB, $\angle A = 60^\circ$; then $\angle 2$ equals: A
- 
- 60°
 - 90°
 - 120°
 - 150°
23. Which of the following angles is (are) congruent?
- right angles
 - vertical angles
- (1) only
 - (2) only
 - (1) and (2)
 - neither (1) nor (2)
24. $\overline{AB}$ and $\overline{CD}$ intersect at O. Then
- $\overline{AO} = \overline{OB}$
 - $\angle AOC = \angle AOD$
 - $\angle AOC = \angle DOB$
 - $\overline{OC} = \overline{OB}$
25. $\overline{AF}$ is the bisector of $\angle BAC$. F then
- belongs to the interior of $\angle BAC$.
 - belongs to the exterior of $\angle BAC$.
 - is on $\angle BAC$.
 - cannot be determined.
26. Two angles form a linear pair. Which of the following is (are) true?
- The two angles may both be right.
 - The two angles may both be acute.
- (1) only
 - (2) only
 - (1) and (2)
 - neither (1) nor (2)

- 5 -

27. $\angle 1$ is the complement of $\angle 2$. What happens to $\angle 1$ as $\angle 2$ increases?

a. also increases
b. decreases
c. remains the same
d. cannot tell

28. An angle is half its supplement. The measure of the angle is

a. 30°
b. 45°
c. 60°
d. 90°

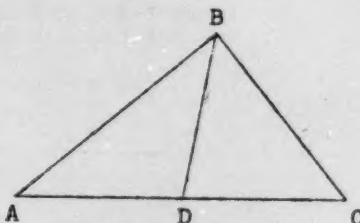
29. If D is between A and C in a $\triangle ABC$, then which of these is (are) always true?

(1) $\angle BDA$ and $\angle BDC$ are supplementary.

(2) $\overline{BD} \perp \overline{AC}$

(3) $\angle BDA = \angle BDC$

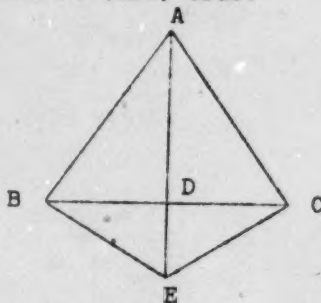
a. (1) only
b. (2) only
c. (3) only
d. All of them



30. In the figure, $\overline{AD}$ is the perpendicular bisector of $\overline{BC}$. Which of the following statements is (are) true?

(1) $\triangle EBC$ is isosceles.
(2) $\triangle EBA = \triangle ECA$.

a. (1) only
b. (2) only
c. (1) and (2)
d. neither (1) nor (2)



31. $\triangle PRS$ is a right triangle with the right angle at R. Which of the following sides is the hypotenuse?

a. $\overline{PR}$
b. $\overline{PS}$
c. $\overline{RS}$
d. none of these

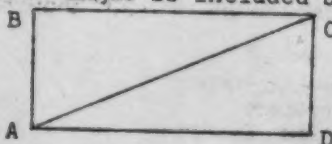
32. The base angles of an isosceles triangle measure 40° each. Which is the measure of the vertex angle?

a. 100°
b. 140°
c. 70°
d. 40°

(OVER)

33. In the figure, which angle is included by sides $\overline{AD}$ and $\overline{DC}$?

- a. $\angle A$
- b. $\angle B$
- c. $\angle C$
- d. $\angle D$



34. If A, B, C are the vertices of a triangle, then they are

- a. collinear.
- b. coplanar.
- c. concurrent.
- d. cannot tell.

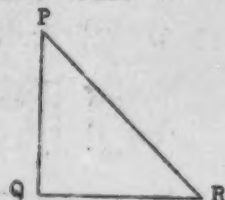
35. If a triangle is equilateral then it is also

- a. acute
- b. isosceles.
- c. equiangular.
- d. all of the above.

36. $\triangle PQR$ is an isosceles right triangle with right angle at Q. Which of the following statements is (are) true?

- (1) $\overline{PR}$ is the hypotenuse of $\triangle PQR$.
- (2) $\angle P = 45^\circ$

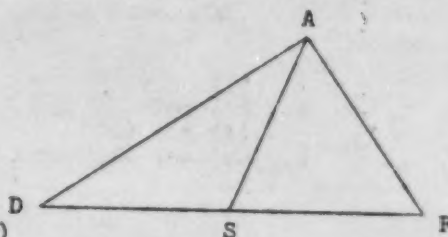
- a. (1) only
- b. (2) only
- c. (1) and (2)
- d. neither (1) nor (2)



37. In the figure $\overline{AS}$ is a median of $\triangle ADF$. Which of the following statements is (are) always true?

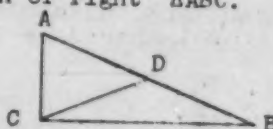
- (1) $\overline{DS} = \overline{SF}$
- (2) $\angle DAS = \angle SAF$

- a. (1) only
- b. (2) only
- c. (1) and (2)
- d. neither (1) nor (2)



38. In the figure, $\overline{CD}$ is a median of right $\triangle ABC$. Then

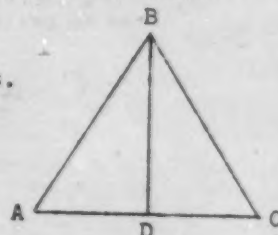
- a. $\overline{CD} = \overline{AD}$
- b. $\overline{CD} = \overline{BC}$
- c. $\overline{CD} = \overline{AC}$
- d. none of the above



39. In the figure, $\triangle ABC$ is isosceles. If $\triangle ABD = \triangle CBD$. Which of the following is (are) true?

- (1) $\overline{BD}$ is an altitude of $\triangle ABC$.
- (2) $\triangle ABD$ and $\triangle CBD$ are right triangles.

- a. (1) only
- b. (2) only
- c. (1) and (2)
- d. neither (1) nor (2)



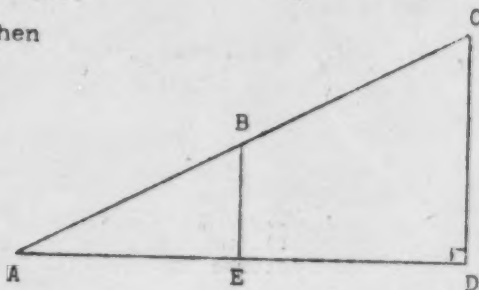
- 7 -

40. Alex, Bert and Carlos are all athletes: a basketball player, a tracker and a swimmer, though not necessarily respectively. The swimmer has just arrived from a sportsfest in Mindanao and has brought durian candies for his daughter. Every Sunday after running a few kilometers for practice, Alex visits his girlfriend who shares an apartment with her unmarried brother Carlos. We can deduce then that

- Alex is the tracker and Carlos is the swimmer.
- Alex is the tracker and Bert is the swimmer.
- Alex is the swimmer and Carlos is the basketball player.
- Alex is the swimmer and Bert is the basketball player.

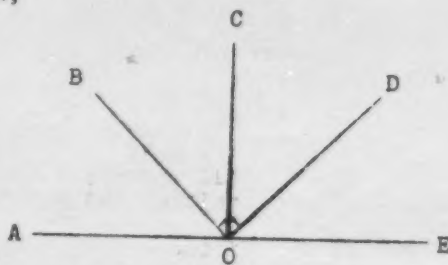
41. In the figure at the right,
 $\overline{BE} \parallel \overline{CD}$. If $AB = 6$,
 $BC = 10$ and $BE = 4$, then
 $\overline{CD}$ equals

- $8\frac{1}{3}$
- $10\frac{2}{3}$
- $12\frac{1}{3}$
- $14\frac{2}{3}$



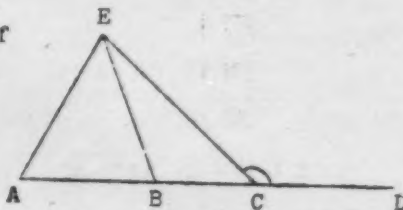
42. In the figure at the right,
 if $\overline{AE} \perp \overline{OC}$ and $\overline{OB} \perp \overline{OD}$ then,

- $\angle AOB = \angle DOE$
- $\angle AOB$ and $\angle DOE$ are complementary
- $\angle BOC = \angle DOE$
- two of the above.



43. In the figure at the right
 $\angle DCE$ is equal to the sum of

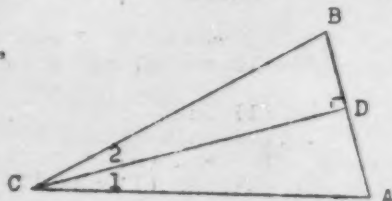
- $\angle EAB$ and $\angle AEB$
- $\angle EBC$ and $\angle BEC$
- $\angle BCE$ and $\angle AEC$
- $\angle ABE$ and $\angle AEC$



44. On the figure on the right,
 $\overline{CD} \perp \overline{AB}$ and $\angle 1 = \angle 2$.

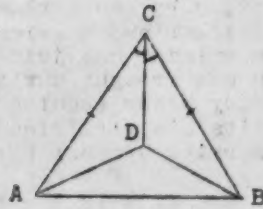
On the basis of the given,
 then $\triangle CDB \cong \triangle CDA$ by

- LL congruence
- Hy. A congruence
- SAS congruence
- ASA congruence



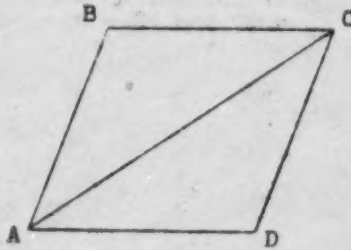
(OVER)

45. Given $\overline{AC} = \overline{BC}$
 $\overline{CD}$ bisects $\angle C$.
 Then $\angle CAD = \angle CBD$.
 Which statement is
 the best reason?



- a. The angles opposite congruent sides are also congruent.
 b. Corresponding angles of two congruent triangles are congruent.
 c. Two parts of an angle bisected are congruent.
 d. The halves of two congruent angles are congruent.
46. If $\triangle ABC \cong \triangle CDA$ then which of the following statements follow(s)?

- (1) $\overline{AC}$ bisects $\angle BAD$
 (2) $\overline{AD} = \overline{AB}$

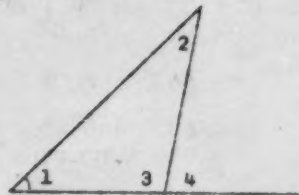


- a. (1) only
 b. (2) only
 c. (1) and (2)
 d. neither (1) nor (2)

47. Which of the following is (are) true about $\angle 4$?

- (1) $\angle 4 > \angle 1$
 (2) $\angle 4 > \angle 2$

- a. (1) only
 b. (2) only
 c. (1) and (2)
 d. neither (1) nor (2)



48. If the distance from P to $\overline{AB}$ is $\overline{PQ}$ then which is always true?

- a. $\overline{PQ} \perp \overline{AB}$
 b. $\overline{PQ} \parallel \overline{AB}$
 c. $\overline{PQ}$ is the perpendicular bisector of $\overline{AB}$.
 d. The relationship between $\overline{PQ}$ and $\overline{AB}$ cannot be determined

49. Which of the following sets of lengths cannot be the sides of a triangle?

- (1) 3 cm, 4 cm, 7 cm
 (2) 10 cm, 11 cm, 9 cm

- a. (1) only
 b. (2) only
 c. (1) and (2)
 d. neither (1) nor (2)

50. Which of the following pairs of lines determine a plane?

- (1) perpendicular lines
- (2) parallel lines

- a. (1) only
- b. (2) only
- c. (1) and (2)
- d. neither (1) nor (2)

(END)

MENTAL AND VOCABULARY ABILITY TEST

On your answer sheet, check the space corresponding to the letter of the correct answer.

Examples:

1. HUMID means (a) humorous (b) solid (c) moist (d) frigid
2. The next number in the series 3 5 7 9 11, 13, 15 is
(a) 11 (b) 13 (c) 15 (d) 17

Sample answer sheet:

- | | a | b | c | d |
|----|-----|-----|-----|-----|
| 1. | () | () | (✓) | () |
| 2. | () | () | () | (✓) |

The correct answer for number 1 is moist which is letter c. The space corresponding to letter c 's checked on the answer sheet.

The correct answer for number 2 is 17 which is letter d. The space corresponding to letter d 's checked on the answer sheet.

If you want to change an answer cross out or erase your first answer and check the space corresponding to your new answer.

Work quickly but accurately. You will be given 30 minutes to answer this test. You may now begin.

1. AMOUNT means (a) average (b) quantity (c) substance (d) combination
2. SIMILAR is opposite in meaning to (a) different (b) alike (c) parallel (d) simple
3. BEHAVE means (a) develop (b) act (c) survive (d) form
4. Which of the things below is most like these three: a ship, a bicycle, a truck? (a) a wheel (b) a train (c) a tire (d) a sail.
5. An object which attracts iron begins with what letter? (a) F (b) M (c) H (d) T
6. CONTRACT is opposite in meaning to (a) close (b) explode (c) expand (d) detract
7. A RESULT is (a) a start (b) a requirement (c) an outcome (d) a cause
8. REGION means (a) belief (b) root (c) subject (d) area
9. What letter comes next in the series B D F H J L ?
(a) E (b) G (c) N (d) P
10. Hydrosphere is to water as atmosphere is to (a) air (b) sea (c) liquid (d) gas
11. A METER is a unit of measure of (a) length (b) mass (c) weight (d) density

-- 2 --

12. A SUBSTANCE is (a) a section (b) a property (c) an arrangement (d) a material.
13. Brick is to wall as _____ is to a table. (a) chair (b) eat (c) kitchen (d) wood
14. LOCATE means (a) rotate (b) occur (c) obtain (d) find.
15. PROCESS is nearest in meaning to (a) method (b) exercise (c) experiment (d) condition
16. DISSOLVE is nearest in meaning to (a) destroy (b) liquefy (c) separate (d) stir
17. If a photograph that is 3 cm wide and 4 cm long is enlarged to be 15 cm wide, how many cm long will it be? (a) 10 (b) 16 (c) 20 (d) 25
18. A quantity increases when it becomes (a) larger (b) complicated (c) complete (d) scattered
19. Circle is to square as sphere is to (a) circumference (b) cube (c) round (d) corner
20. OBSERVE means (a) determine (b) watch (c) indicate (d) reflect
21. MEASURE is nearest in meaning to (a) record (b) define (c) locate (d) estimate
22. Juan is the fifth child from each end of a row. How many people are there in a row? (a) 11 (b) 10 (c) 7 (d) 9
23. ABUNDANT means (a) limited (b) different (c) plenty (d) large
24. An EVIDENCE is (a) a proof (b) an arrangement (c) a contract (d) a conclusion
25. The next number in the series 10 8 11 9 12 10 is (a) 13 (b) 14 (c) 15 (d) 10
26. VARIABLE means (a) changeable (b) constant (c) continuous (d) balanced
27. An event which is sure to happen is said to be (a) probable (b) possible (c) doubtful (d) certain
28. The next number in the series 0 1 3 6 10 15 21 is (a) 21 (b) 23 (c) 25 (d) 28
29. DIVIDE means (a) make bigger (b) break up (c) expand (d) enlarge
30. ENVIRONMENT means (a) structure (b) container (c) layer (d) surrounding
31. CHANGE is opposite in meaning to (a) vary (b) alter (c) make different (d) be consistent

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32. One number is wrong in the following series. What should that number be? 6 1 6 2 6 3 6 4 6 5 6 7
(a) 6 (b) 8 (c) 9 (d) 5
33. EVAPORATE is opposite in meaning to (a) solidify
(b) melt (c) condense (d) become a gas
34. The next number in the series 1 2 4 5 7 8 is
(a) 3 (b) 6 (c) 9 (d) 10.
35. DENSE means (a) steady (b) thick (c) scattered
(d) bright.
36. You pay ₱7.00 for 5 kilograms of sugar. One and one-half kilograms cost (a) ₱1.40 (b) ₱2.10 (c) ₱2.80
(d) ₱3.50.
37. FRACTION means (a) a part of a whole (b) a factor
(c) subtraction (d) separation
38. INFLATE means (a) decrease (b) flatten (c) blow up
(d) raise up
39. The next number in the series 5 10 7 14 11 22 19 is
(a) 16 (b) 32 (c) 38 (d) 44.
40. Jose had twelve books. He bought three more and then gave six to Carlos. How many books does Jose have now?
(a) 3 (b) 6 (c) 9 (d) 12

MENTAL AND VOCABULARY ABILITY TEST

On your answer sheet, check the space corresponding to the letter of the correct answer.

Examples:

1. HUMID means (a) humorous (b) solid (c) moist (d) frigid
2. The next number in the series 3 5 7 9 11 13 15 is
(a) 11 (b) 13 (c) 15 (d) 17

Sample answer sheet:

- | | a | b | c | d |
|----|-----|-----|-----|-----|
| 1. | () | () | (✓) | () |
| 2. | () | () | () | (✓) |

The correct answer for number 1 is moist which is letter c. The space corresponding to letter c is checked on the answer sheet.

The correct answer for number 2 is 17 which is letter d. The space corresponding to letter d is checked on the answer sheet.

If you want to change an answer cross out or erase your first answer and check the space corresponding to your new answer.

Work quickly but accurately. You will be given 30 minutes to answer this test. You may now begin.

1. PROCEED means (a) continue (b) stop (c) change (d) separate
2. COLLIDE is nearest in meaning to (a) strike (b) insert (c) spin (d) rotate
3. QUANTITY means (a) substance (b) amount (c) scale (d) abundant
4. The next number in the series 2 3 9 10 30 31 93 is
(a) 94 (b) 95 (c) 96 (d) 97
5. A large box contains two small boxes. In each small box, there are five very small boxes. How many boxes are there in all? (a) 8 (b) 10 (c) 12 (d) 13
6. A BOND is (a) a sudden explosion (b) something that connects (c) necessary part (d) faulty structure
7. TRANSFER means (a) remove (b) adopt (c) substitute (d) retain
8. CURRENT is nearest in meaning to (a) direction (b) dimension (c) flow (d) fast
9. COMBINE means (a) separate (b) displace (c) mix (d) cancel
10. Four is to $\frac{1}{2}$ as sixteen is to (a) 2 (b) 4 (c) 8 (d) 32.
11. COMPLICATED means (a) simple (b) complex (c) easy (d) circular.

- 2 -

12. A GRAM is a unit of (a) length (b) mass (c) volume (d) density
13. INITIAL means (a) first (b) last (c) interruption (d) internal
14. What letter comes next in the series? J N R V ?
(a) S (b) T (c) W (d) Z
15. DETECT means (a) appear (b) discover (c) classify (d) confirm
16. VERTICAL is opposite in meaning to (a) horizontal (b) slanting (c) curved (d) perpendicular
17. The next number in the series 1 5 2 10 3 15 4 is
(a) 5 (b) 6 (c) 10 (d) 20
18. PERFORM means (a) do (b) rub (c) shift (d) treat
19. CONSTANT is opposite in meaning to (a) significant (b) deficient (c) familiar (d) changing
20. The next number in series 9 10 8 24 6 7 5 is
(a) 3 (b) 15 (c) 16 (d) 20
21. REFLECT means (a) go inside (b) pass by (c) bounce back (d) absorb
22. TRANSFORM is nearest meaning to (a) change (b) increase (c) constant (d) same
23. RELATION means (a) function (b) connection (c) intuition (d) reason
24. A MODEL is (a) a partner (b) an outline (c) a representation (d) a portion
25. The next number in the series 4 4 1 5 5 1 6 is
(a) 2 (b) 4 (c) 6 (d) 8
26. EFFECT is nearest in meaning to (a) result (b) design (c) trend (d) idea
27. REPRESENT means (a) select (b) detect (c) stand for (d) made of
28. Jaime is facing north. He walks forward 10 steps, turns to his right and walks 10 steps. The direction in which he is now facing is (a) north (b) east (c) north-west (d) north-east.
29. DESCRIBE means (a) tell about (b) examine (c) attach (d) absorb
30. ASSUME means (a) make sure (b) facilitate (c) accept as true (d) generalize
31. An artist works on a drawing for 8 weeks and earns P200. If he works 5 days a week, how much does he earn every day? (a) P1 (b) P5 (c) P5 (d) P8

- 3 -

32. CALCULATE means (a) denote (b) compute (c) synthesize
(d) test
33. ORIGINAL means (a) well-known (b) essential (c) first
(d) second-hand
34. Eight turns of a screw advance it 10 cm. How many cm
will ten turns advance it? (a) 8 (b) $10\frac{1}{2}$ (c) $12\frac{1}{2}$
(d) 14
35. If the following words were arranged in order, with what
letter would the middle word begin?
Week Year Day Second Month Hour Minute
(a) D (b) H (c) W (d) M
36. The next number in the series 4 6 3 7 9 6 10 is
(a) 4 (b) 7 (c) 12 (d) 14
37. EMIT means to (a) give off (b) accept (c) absorb
(d) put on
38. CONSERVE is opposite in meaning to (a) save (b) deposit
(c) waste (d) utilize
39. A clock that gains 2 minutes every day was set right at
noon Tuesday. What time was it by the clock at midnight
the following Thursday? (a) 12:00 (b) 12:01
(c) 12:03 (d) 12:05
40. Which of the following expression is most definite
(a) soon (b) early (c) morning (d) ten A.M.

LEARNING ENVIRONMENT SCALE

D I R E C T I O N S

The questions you will see in this booklet are to determine what your class is like. This is NOT a "test". You are asked to give your honest opinion about the SCIENCE or MATHEMATICS class WHICH YOU ARE NOW ATTENDING.

In answering each question, go through the following steps:

1. Read the statement carefully.
2. Think about how well the statement describes your class (science or mathematics class you are now enrolled).
3. Encircle a number opposite each statement using the following codes:
 - If you STRONGLY DISAGREE with the statement, encircle 1.
 - If you DISAGREE with the statement, encircle 2.
 - If you AGREE with the statement, encircle 3.
 - If you STRONGLY AGREE with the statement, encircle 4.
4. You have approximately 40 minutes to answer all the questions given here. Please answer ALL the questions.

LEARNING ENVIRONMENT SCALE

	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE
1. Students in our class help each other.	1	2	3	4
2. The equipment and apparatus which students need are in the classroom.	1	2	3	4
3. We enjoy our class.	1	2	3	4
4. There are long periods during which students do nothing.	1	2	3	4
5. Lack of achievement does not bother the members of the class.	1	2	3	4
6. Our teacher makes use of various teaching aids.	1	2	3	4
7. The objectives of the lessons are clear to most students.	1	2	3	4
8. Most students want to do better than the other members of the class.	1	2	3	4
9. Textbooks are available to most students.	1	2	3	4
10. Lively discussions are encouraged by our teacher.	1	2	3	4
11. Each student knows all the other students in our class.	1	2	3	4
12. The students would be proud to show our classroom to visitors.	1	2	3	4
13. Many students are dissatisfied with most of what is done in class.	1	2	3	4
14. Students who have nothing to do disturb the class work.	1	2	3	4
15. Members of the class do not care what other students do.	1	2	3	4

(OVER)

LEARNING ENVIRONMENT SCALE

	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE
16. Our teacher explains clearly.	1	2	3	4
17. Different methods are used in the presentation of lessons.	1	2	3	4
18. Students compete for the best work.	1	2	3	4
19. Our classroom is comfortable.	1	2	3	4
20. Our teacher answers our questions clearly.	1	2	3	4
21. Members of our class are personal friends.	1	2	3	4
22. There are science/mathematics displays around the room.	1	2	3	4
23. Most students do not like to be absent from class.	1	2	3	4
24. Most class activities are <u>not</u> organized.	1	2	3	4
25. Most students would like the other members of the class to do well.	1	2	3	4
26. Our teacher makes students more interested about the subject.	1	2	3	4
27. Lessons are presented clearly.	1	2	3	4
28. Only a few members of the class try to do better than the others.	1	2	3	4
29. Our classroom is too crowded.	1	2	3	4
30. Our teacher encourages independent thinking.	1	2	3	4

(CONTINUE ON PAGE 3)

LEARNING ENVIRONMENT SCALE

31. All students know each other very well.
32. There is enough room for both individual and group work.
33. After the class, the students have a feeling of satisfaction.
34. Our class usually goes on smoothly.
35. Most students sincerely want the class to be a success.
36. Our teacher encourages all students to do their best.
37. Assignments are helpful in understanding the lessons.
38. Students feel left out unless they compete with their classmates.
39. Our room is kept clean and neat.
40. Our teacher inspires students to do better.
41. Students do not know each other well enough.
42. Most apparatus and equipment are in working condition.
43. Students are well-satisfied with the work done in class.
44. Many class members are confused during class meetings.
45. Lack of achievement would mean nothing to most members of our class.

STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4

LEARNING ENVIRONMENT SCALE

	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE
46. Our teacher is enthusiastic in his teaching.	1	2	3	4
47. Our lessons are interesting.	1	2	3	4
48. Most students cooperate rather than compete with one another.	1	2	3	4
49. We have enough apparatus for use during experiments.	1	2	3	4
50. Our teacher knows the subject very well.	1	2	3	4
51. Only a few members of the class know each other very well.	1	2	3	4
52. Audio-visual aids (charts, pictures, etc.) are used in the classroom.	1	2	3	4
53. OK talaga ang klase namin.	1	2	3	4
54. There is much confusion during class meetings.	1	2	3	4
55. Students do <u>not</u> care about what others do in class.	1	2	3	4
56. Our teacher encourages students to ask questions.	1	2	3	4
57. Most students are able to follow the lessons.	1	2	3	4
58. There is much competition in the class.	1	2	3	4
59. Most of the supplies needed for our experiment are available.	1	2	3	4
60. Our teacher comes to class well prepared.	1	2	3	4

-- END --

UP-NSDB PROJECT 7501 Ed.

FOR PHYSICS CLASSES

A list of experiments and their titles for your Physics class is given below. Please let us know if your class has performed each experiment. **THIS IS NOT A TEST!**

Before answering each number, open your notebook, book, or notes on experiments to find out if your class has performed each experiment. The titles will give you an idea of what the experiment is about.

If your class has done the experiment, encircle YES; if the experiment was not done in your class, encircle NO. You have approximately 50 minutes to answer all the numbers here.

	<u>Title</u>	<u>Performed in class?</u>	
Expt. No.	1.1 Elongation of a Spring	YES	NO
Expt. No.	1.2 Factors Affecting Period of A Pendulum	YES	NO
Expt. No.	1.3 The Recording Timer	YES	NO
Expt. No.	2.1 Uniform Speed	YES	NO
Expt. No.	2.2 Uniformly Accelerated Motion	YES	NO
Study Guide	2.8 Reaction Time	YES	NO
Expt. No.	3.1 Force and Acceleration	YES	NO
Expt. No.	3.2 Mass and Acceleration	YES	NO
Activity	3.1 Newton's First Law of Motion	YES	NO
Activity	3.2 Introduction to Galileo's Thought Experiment	YES	NO
Study Guide	3.9 The Accelerometer	YES	NO
Activity	4.1 Projectile Motion	YES	NO
Activity	4.2 Uniform Circular Motion	YES	NO
Expt. No.	5.1 Conservation of Momentum	YES	NO
Expt. No.	7.1 Pressure-Volume Relationship of Gases	YES	NO
Activity	7.1 Density of Solids	YES	NO
Study Guide	7.1 Density of Irregularly-Shaped Solids	YES	NO
Activity	7.3 Surface Tension	YES	NO

(Over), Continue on the other side.

		<u>Title</u>	<u>Performed in class?</u>	
Activity	7.4	Cohesion and Adhesion	YES	NO
Expt. No.	8.1	Linear Expansion of Solids	YES	NO
Expt. No.	8.2	Specific Heat	YES	NO
Activity	9.1	Generating Wave Pulses and Wave Trains	YES	NO
Activity	9.2	Ripple Tank	YES	NO
Demonstration	9.3-			
	9.5	Reflection/Refraction	YES	NO
Activity	9.6	Diffraction	YES	NO
Activity	9.7	Interference	YES	NO
Activity	9.8	Standing Waves	YES	NO

UP-NSDB PROJECT 7501 Ed.

FOR PHYSICS CLASSES

A list of experiments and their titles for your Physics class is given below. Please let us know if your class has performed each experiment. THIS IS NOT A TEST.

Before answering each number, open your notebook, book or notes on experiments to find out if your class has performed each experiment. The titles will give you an idea of what the experiment is about.

If your class has done the experiment, encircle YES; if the experiment was not done in your class, encircle NO. You have approximately 50 minutes to answer all the numbers here.

		<u>Title</u>	<u>Performed in class?</u>	
Activity	9.1	Generating Waves Pulses and Wave Trains	YES	NO
Activity	9.2	Ripple Tank	YES	NO
Activity	9.3	Reflection	YES	NO
Demonstration		Refraction	YES	NO
Activity	9.6	Diffraction	YES	NO
Activity	9.7	Interference	YES	NO
Activity	9.8	Standing Waves	YES	NO
Activity	10.1	Attraction and Repulsion between Charged Bodies	YES	NO
Activity	10.2	Charging an Electroscope	YES	NO
Study Guide	10.4	Electric Induction	YES	NO
Activities	11.1-11.3	Detection of Electric Current	YES	NO
Activity	11.4	Production of Electric Current	YES	NO
Activities	11.5-11.6	Nature of Electric Current	YES	NO
Activities	11.7-11.9	Ohm's Law	YES	NO
Study Guide	11.5	Resistors in Series	YES	NO
Study Guide	11.7	Resistors in Parallel	YES	NO
Activity	12.1	Tracing Magnetic Fields of Permanent Magnets	YES	NO

(OVER)

- 2 -

		<u>Title</u>	<u>Performed in class?</u>	
Activity	12.2	Magnetic Field of Current-Carrying Wires	YES	NO
Activity	12.4	Force Exerted by a Magnetic Field on Current-Carrying Wires	YES	NO
Activity	13.1	Electromagnetic Induction	YES	NO
Demonstration		Hertz Experiment	YES	NO
Activity	14.1	Focal Length of a Lens	YES	NO
Activity	14.2	Dispersion of Light by a Prism	YES	NO
Activity	14.3	Interference of Light	YES	NO
Activity	14.5	Diffraction Grating Experiment	YES	NO
Activity	14.7	Determination of Wavelength of Light	YES	NO
Activity	14.8	Polarization	YES	NO
Study Guide	14.1	Reflection of Light	YES	NO
Study Guide	14.2	Refraction of Light	YES	NO
Study Guide	14.6	Reflection of Particles	YES	NO
Activity	16.1	Spectra Emitted by Elements	YES	NO
Study Guide	17.3	Radioactive Decay Analogue	YES	NO

UP-NSDB PROJECT 7501 Ed.

FOR CHEMISTRY CLASSES

A list of experiments and their titles for your Chemistry class is given below. Please let us know if your class has performed each experiment. **THIS IS NOT A TEST!**

Before answering each number, open your notebook, book, or notes on experiments to find out if your class has performed each experiment. The titles will give you an idea of what the experiment is about.

If your class has done the experiment, encircle YES; if the experiment was not done in your class, encircle NO. You have approximately 50 minutes to answer all the numbers here.

<u>Expt. No.</u>	<u>Title</u>	<u>Performed in class?</u>	
2.2	Which properties of pure materials are most useful in identifying them?	YES	NO
2.3	Is it possible to separate (1) a pure liquid, and (2) a homogeneous liquid mixture into different components by distillation?	YES	NO
2.6	What is the effect of heat on substances?	YES	NO
2.7	By what properties can acids and bases be identified?	YES	NO
2.8	Can light passed through mixtures be used to classify them?	YES	NO
3.1	What is formed when the products obtained from burning the elements magnesium and sulfur are added to water?	YES	NO
3.2	Copper oxide is subjected to heat in the presence of hydrogen. Is it possible for hydrogen to remove the oxygen from the compound?	YES	NO
3.3	Does water undergo a phase or a chemical change when electricity is passed through it?	YES	NO
4.1	How does the mass of the substances produced from a chemical change compare with the mass of the substances before the change occurred?	YES	NO
4.2	Does a given amount of lead nitrate react completely with any amount of potassium bromide?	YES	NO
5.1	Are compounds composed of particles?	YES	NO

(OVER); Continue on other side.

- 2 -

<u>Expt. No.</u>	<u>Title</u>	<u>Performed in class?</u>	
6.1	Do ammonia and hydrogen chloride particles move the same distance during the same interval of time?	YES	NO
6.2	Does air occupy space and exert pressure?	YES	NO
6.3	What will happen to the volume of a gas if we increase the pressure on it?	YES	NO
6.4	What happens to the volume of air when we change its temperature?	YES	NO
7.1	What effects does the absorption of equal amounts of heat have on the temperature of different amounts of water?	YES	NO
7.2	Do liquids evaporate without application of heat?	YES	NO
7.3	Does alcohol evaporate in a closed container?	YES	NO
7.4	Do solids melt or change directly to gas when heat is applied?	YES	NO
8.1	How can you measure the size of an object without seeing it?	YES	NO

UP-NSDB PROJECT 7501 Ed.

FOR CHEMISTRY CLASSES

A list of experiments and their titles for your Chemistry class is given below. Please let us know if your class has performed each experiment. **THIS IS NOT A TEST!**

Before answering each number, open your notebook, book, or notes on experiments to find out if your class has performed each experiment. The titles will give you an idea of what the experiment is about.

If your class has done the experiment, encircle YES; if the experiment was not done in your class, encircle NO. You have approximately 50 minutes to answer all the numbers here.

<u>Expt. No.</u>	<u>Title</u>	<u>Performed in class?</u>	
8.1	How can you measure the size of an object without seeing it?	YES	NO
9.1	Do substances emit characteristic colors when heat changes them to the gas phase?	YES	NO
9.2	Which atoms become positively-charged in compounds of copper and chlorine?	YES	NO
9.3	Which element has a greater tendency to gain electrons, chlorine or bromine?	YES	NO
12.1	How much heat is involved when one mole of sodium hydroxide reacts with one mole of hydrochloric acid?	YES	NO
12.2	To determine whether some spontaneous processes are exothermic.	YES	NO
13.1	Which component in a solution is the solvent?	YES	NO
13.2	How can you determine if solutions contain different amounts of solute in the same amount of solvent?	YES	NO
13.3	Is there a limit to the amount of solute that can dissolve in a given volume of solvent at a given temperature?	YES	NO
13.4	Identify solutions which are saturated, unsaturated or supersaturated.	YES	NO
13.5	What factors affect the solubility of a substance?	YES	NO

- 2 -

<u>Expt. No.</u>	<u>Title</u>	<u>Performed in class?</u>	
13.6	What is the effect of pressure and temperature on the solubility of gases in liquids?	YES	NO
13.7	Is water attracted to charged objects?	YES	NO
13.8	Order three unknowns according to increasing polarity.	YES	NO
14.1	How do the evaporation rates of a pure solvent and a solution of a non-volatile solute compare in a closed system?	YES	NO
14.2	What is the effect of the solute sugar on the boiling point of the solvent water?	YES	NO
14.3	What is observed in osmosis?	YES	NO
15.1	To measure the rate of the reaction between solid magnesium and hydrochloric acid as the reaction proceeds.	YES	NO
15.2	Does the temperature affect the reaction rate?	YES	NO
15.3	Does the presence of iron (III) chloride affect the decomposition rate of hydrogen peroxide?	YES	NO
16.1	Is the reaction of $\text{NO}_2(\text{g})$ to produce $\text{N}_2\text{O}_4(\text{g})$ reversible?	YES	NO
16.2	What is the effect of temperature on the $\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$ equilibrium?	YES	NO
16.3	What is the effect of pressure on the $\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$ equilibrium?	YES	NO

UP-NSDE PROJECT 7501 Ed.

FOR BIOLOGY CLASSES

A list of experiments and their titles for your Biology course is given below. Please let us know if your class has performed each experiment. **THIS IS NOT A TEST!**

Before answering each number, open your notebook, book, or notes on experiments to find out if your class has performed each experiment. The titles give you an idea of what the experiment is all about.

If your class has done the experiment, encircle YES; if the experiment was not done in your class, encircle NO. You have approximately 50 minutes to answer the numbers here.

<u>Expt. No.</u>	<u>Title</u>	<u>Performed in class?</u>	
1.1	Observing Living Things	YES	NO
1.3	Interrelationship of Producers and Consumers	YES	NO
1.4	Use of the Microscope: Introduction	YES	NO
2.1	Population Growth: A Model	YES	NO
3.1	The Study of a Biotic Community	YES	NO
4.1	Structural Characteristic in the Classification of Animals	YES	NO
4.2	The Levels of Classification	YES	NO
5.1	The Structure of the Flowering Plant	YES	NO
5.3	Diversity of the Plant Kingdom	YES	NO
6.1	A Garden of Microorganisms	YES	NO
7.1	A Microbial Menu or Food for Microbes	YES	NO
7.2	Growing Soil Microbes by the "Mud-Pie" Techniques	YES	NO
8.2	The <u>Kaingin</u> System in the Philippines	YES	NO
9.2	Succession in Freshwater Communities: A Laboratory Study	YES	NO

UP-NSDB PROJECT 7501 Ed.

FOR BIOLOGY CLASSES

A list of experiments and their titles for your Biology course is given below. Please let us know if your class has performed each experiment. **THIS IS NOT A TEST!**

Before answering each number, open your notebook, book, or notes on experiments to find out if your class has performed each experiment. The titles will give you an idea of what the experiment is all about.

If your class has done the experiment, encircle YES; if the experiment was not done in your class, encircle NO. You have approximately 50 minutes to answer the numbers here.

<u>Exercise No.</u>	<u>Title</u>	<u>Performed in class?</u>	
8.2	The Kaingin System in the Philippines	YES	NO
9.2	Succession in Freshwater Communities: A Laboratory Study	YES	NO
9.3	Effects of Salinity on Living Organisms	YES	NO
10.1	The Comparison of Form	YES	NO
11.1	The Effects of Barriers on Dispersal	YES	NO
12.3	Diffusion Through a Membrane	YES	NO
12.4	Inside a <u>Hydrilla</u> Leaf	YES	NO
12.5	Diversity in Plant Cells	YES	NO
12.6	Diversity in Animal Cells	YES	NO
12.8	Mitosis	YES	NO
13.1	Extraction and Separation of Pigments from Green Leaves	YES	NO
13.3	Factors Affecting Enzyme Activity	YES	NO
13.5	Tropisms	YES	NO
14.1	The Frog: Anatomical Structures and Some Physiological Processes	YES	NO
14.3	Capillary Circulation	YES	NO
14.6	Muscles at Work	YES	NO
14.7	Environment and Water Loss	YES	NO
15.1	Regeneration in Planarians	YES	NO

(OVER)

- 2 -

<u>Exercise No.</u>	<u>Title</u>	<u>Performed in class?</u>	
15.2	Regeneration in Plants	YES	NO
15.3	Reproduction in Flowering Plants	YES	NO
16.1	Patterns of Mendelian Inheritance	YES	NO
16.2	Human Inheritance	YES	NO
17.3	An Effect of Population Size: A Study in Human Evolution	YES	NO
18.1	The Effect of Light and Gravity on the Behavior of Fruit Flies	YES	NO
19.1	Human Characteristics	YES	NO

Teacher Demonstrations:

1.	Focusing the Microscope	YES	NO
2.	Dissection of the Frog	YES	NO

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FOR GENERAL SCIENCE CLASSES

A list of experiments and their titles for your General Science class is given below. Please let us know if your class has performed each experiment. **THIS IS NOT A TEST!**

Before answering each number, open your notebook, book, or notes on experiments to find out if your class has performed each experiment. The titles will give you an idea of what the experiment is about.

If your class has done the experiment, encircle YES; if the experiment was not done in your class, encircle NO. You have approximately 50 minutes to answer all the numbers here.

Expt. No.	Title	<u>Performed in class?</u>	
		YES	NO
1-1	Building a Battery	YES	NO
2-1	Using the Battery	YES	NO
3-1	Building a Force Measurer	YES	NO
4-1	Calibrating a Force Measurer	YES	NO
4-2	Using a Force Measurer	YES	NO
5-1	Using an Inclined Plane	YES	NO
5-2	Using a Pulley	YES	NO
6-1	Using a Lever	YES	NO
6-2	Defining the Principle of the Lever	YES	NO
6-3	Concept of Friction	YES	NO
7-1	Load and Friction	YES	NO
7-2	Surface Texture and Friction	YES	NO
7-3	Variables in an Experiment	YES	NO
8-1	Measuring Potential Energy	YES	NO
8-2	Potential Energy to Kinetic Energy	YES	NO
8-3	Potential Energy and Speed	YES	NO
9-1	Measuring Changing Energy	YES	NO
10-1	Recapitulation	YES	NO
10-2	Light Energy	YES	NO
10-3	Heat Energy	YES	NO
10-4	Mechanical Energy	YES	NO

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FOR GENERAL SCIENCE CLASSES

A list of experiments and their titles for your General Science class is given below. Please let us know if your class has performed each experiment. **THIS IS NOT A TEST!**

Before answering each number, open your notebook, book, or notes on experiments to find out if your class has performed each experiment. The titles will give you an idea of what the experiment is about.

If your class has done the experiment, encircle YES; if the experiment was not done in your class, encircle NO. You have approximately 50 minutes to answer all the numbers here.

<u>Activity No.</u>	<u>Title</u>	<u>Performed in class?</u>	
10-1	Recapitulation	YES	NO
10-2	Light Energy	YES	NO
10-3	Heat Energy	YES	NO
10-4	Mechanical Energy	YES	NO
11-1	Copper Plating	YES	NO
11-2	Wet Cell	YES	NO
11-3	Analyzing the Battery	YES	NO
12-1	Building Circuits	YES	NO
12-2	Heating Effect of Electricity	YES	NO
12-3	Magnetic Effect of Electricity	YES	NO
12-4	Factors Affecting Strength of an Electromagnet	YES	NO
12-5	Detecting Magnetic Effect of Electricity	YES	NO
12-6	Comparing Batteries	YES	NO
13-1	Building a Heat Measurer	YES	NO
13-2	Defining Heat	YES	NO
13-3	Testing the Heat Model	YES	NO
14-1	Examining Different Samples of Matter	YES	NO
14-2	Weighing Blocks of Wood	YES	NO
14-3	Finding Mass of Objects	YES	NO

(OVER)

- 2 -

<u>Activity No.</u>	<u>Title</u>	<u>Performed in class?</u>	
14-4	Determining Volume of Solids	YES	NO
14-5	Water Displacement Method	YES	NO
14-6	Finding Mass and Volume of Iron and Carbon Rods	YES	NO
14-7	Determining Density of Carbon and Iron	YES	NO
14-8	Density of Liquids	YES	NO
14-9	Floating	YES	NO
14-10	Mass and Volume of Gas	YES	NO
15-1	Diffusion	YES	NO
15-2	Chemical Test for Carbon Dioxide	YES	NO
15-3	Testing Materials That Produce Carbon Dioxide	YES	NO
15-4	Testing Presence of Copper in Different Materials	YES	NO
15-5	Testing Presence of Carbon in Different Materials	YES	NO
16-1	Iodine Test	YES	NO
16-2	Physical Model for Combining Elements	YES	NO
16-3			
17-1	Dissolving Substances	YES	NO
17-2	Forming a Compound	YES	NO
17-3	Analysis of Lead Iodide	YES	NO
17-4	Physical Model	YES	NO
17-5	Determining How Elements Combine	YES	NO
18-1	Zinc Test	YES	NO
18-2	Zinc-Copper Sulfate System	YES	NO

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FOR GEOMETRY CLASSES

A list of postulates and theorems with their titles for your Geometry course is given below. Please let us know if each one was taken up in your class. THIS IS NOT A TEST!

Before answering each number, open your notebook or book to find out if your class has taken up each postulate or theorem. The title will give you an idea of what the postulate or theorem is about.

For each lesson, encircle YES if it was taken in your class. If the postulate or theorem was not taken in class, encircle NO.

<u>Postulate or Theorem</u>	<u>Title</u>	<u>Taken up in class?</u>	
Pos. 1	Two points determine a line.	YES	NO
Pos. 2	Given points A and B, there corresponds a unique number called the distance between A and B denoted by AB	YES	NO
Pos. 3	The points of a line and the set of numbers can be put into a one-to-one correspondence.	YES	NO
Pos. 4	Given two points A and B of a line, a coordinate system can be chosen in such a way that the coordinate of A is zero and the coordinate of B is positive.	YES	NO
Pos. 5	a) Given a line, there is a point not on the line. b) Given a plane, there is a point not on the plane.	YES	NO
Pos. 6	Three noncollinear points determine a plane.	YES	NO
Pos. 7	Plane Separation Postulate	YES	NO
Th. 4.1	A line contains an infinite number of points.	YES	NO
Th. 4.2	A line and a point not on the line lie in exactly one plane.	YES	NO
Th. 4.3	The Point-Plotting Theorem	YES	NO
Pos. 8	To every angle there corresponds a unique number between 0° and 180° , called the <u>measure</u> of that angle.	YES	NO

(OVER), Continue on other side.

- 2 -

<u>Postulate or Theorem</u>	<u>Title</u>	<u>Taken up in class?</u>	
Pos. 9	Given a ray AB on the edge of a half-plane α . To every number r between 0° and 180° , there corresponds exactly one ray AC with C on α such that $m\angle BAC = r$.	YES	NO
Pos. 10	If D is in the interior of $\angle BAC$ then $m\angle BAD + m\angle DAC = m\angle BAC$.	YES	NO
Pos. 11	Linear Pair Postulate	YES	NO
Th. 5.1	If AD bisects $\angle BAC$, then $m\angle BAD = \frac{1}{2} m\angle BAC$.	YES	NO
Th. 5.2	An angle is congruent to itself. A line is congruent to itself.	YES	NO
Th. 5.3	Two segments congruent to the same segment are congruent to each other.	YES	NO
Th. 5.4	All right angles are congruent.	YES	NO
Th. 5.5	Supplements of congruent angles are congruent.	YES	NO
Th. 5.6	Complements of congruent angles are congruent.	YES	NO
Th. 5.7	Vertical angles are congruent.	YES	NO
Th. 5.8	Given a plane α and a line $\overline{AB}$ on α . There is one and only one line perpendicular to AB at point A.	YES	NO

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FOR PLANE GEOMETRY CLASSES

A list of postulates and theorems with their titles for your Geometry course is given below. Please let us know if each one was taken up in your class. **THIS IS NOT A TEST!**

Before answering each number, open your notebook or book to find out if your class has taken up each postulate or theorem. The title will give you an idea of what the postulate or theorem is about.

For each lesson, encircle YES if it was taken in your class. If the postulate or theorem was not taken in class, encircle NO.

<u>Postulate or Theorem</u>	<u>Title</u>	<u>Taken up in class?</u>	
Th. 7.1	Two triangles congruent to the same triangle are congruent to each other.	YES	NO
Pos. 12	SAS Congruence	YES	NO
Th. 7.2	LL CONGRUENCE. If in two right triangles the two legs of one are congruent respectively to the two legs of the other, then the two right triangles are congruent.	YES	NO
Pos. 13	ASA Congruence	YES	NO
Th. 7.3	LA CONGRUENCE. If in two triangles, a leg and an adjacent acute angle of one are congruent respectively to a leg and an acute angle of the other, then the two right triangles are congruent.	YES	NO
Th. 7.4	The base angles of an isosceles triangle are congruent.	YES	NO
Th. 7.5	If two angles of a triangle are congruent then the triangle is isosceles.	YES	NO
Th. 7.6	SSS CONGRUENCE. If in two triangles the three sides of one are congruent respectively to the three sides of the other, then the two triangles are congruent.	YES	NO
Th. 8.1	If in a triangle two sides are not congruent, then the angles opposite these sides are not congruent and the longer side is opposite the greater angle.	YES	NO
Th. 8.2	If in a triangle two angles are not congruent, then the sides opposite these angles are not congruent, and the side opposite the greater angle is the longer side.	YES	NO

(OVER)

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<u>Postulate or Theorem</u>	<u>Title</u>	<u>Taken up in class?</u>	
Th. 8.3	The line segment from a point to a line along the perpendicular is shorter than any line segment from the point to the line.	YES	NO
Th. 8.4	The sum of the lengths of two sides of a triangle is greater than the length of the third side.	YES	NO
Th. 9.1	SAA CONGRUENCE. If in two triangles the vertices can be paired in such a way that two pairs of corresponding angles are congruent and the corresponding sides opposite one of the congruent angles are also congruent, then, the two triangles are congruent.	YES	NO
Th. 9.2	HY. A. CONGRUENCE. If the hypotenuse and an acute angle of a right triangle are congruent respectively to the hypotenuse and an acute angle of another right triangle, then the two triangles are congruent.	YES	NO
Pos. 14	HY. L. CONGRUENCE	YES	NO
Th. 10.1	If two coplanar lines are cut by a transversal making a pair of congruent alternate-interior angles; then the lines are parallel.	YES	NO
Th. 10.2	If two lines are perpendicular to the same line, then they are parallel.	YES	NO
Th. 10.3	If two coplanar lines are cut by a transversal making a pair of congruent exterior-interior angles, then the two lines are parallel.	YES	NO
Th. 10.4	Given a line and a point not on the line. Through the given point there is a line parallel to the given line.	YES	NO
Pos. 15	The Parallel Postulate. Given a line and a point not on the line. Through the point there is one and only one line parallel to the given line.	YES	NO
Th. 10.5	If two lines are parallel, alternate-interior angles made by a transversal are congruent.	YES	NO
Th. 10.6	The sum of the measures of the angles of a triangle is 180.	YES	NO
Th. 10.7	EXTERIOR ANGLE THEOREM. The exterior angle of a triangle is greater than either of the angles not adjacent to it.	YES	NO

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<u>Postulate or Theorem</u>	<u>Title</u>	<u>Taken up in class?</u>	
Pos. 16	If a line intersects one side of a triangle at an interior point of this side, then it also intersects the other side.	YES	NO
Pos. 17	If a line intersects two sides of a triangle and is parallel to the third side, then it divides the first two sides proportionally.	YES	NO
Th. 11.1	If a line segment $\overline{DE}$ intersects two sides $\overline{AC}$ and $\overline{BC}$ of a triangle ABC and is parallel to the third side $\overline{AB}$, then $\frac{ CD }{ CA } = \frac{ DE }{ AB }$	YES	NO
Th. 11.2	If a line divides two sides of a triangle proportionally, then the line is parallel to the third side.	YES	NO
Th. 11.3	If a set of three or more parallel lines is cut off by two or more transversals, then the segments cut off are proportional.	YES	NO
Th. 11.4	If a set of two or more lines are cut by three or more parallel planes, the corresponding segments cut off on the lines are proportional.	YES	NO
Th. 12.1	If in triangle ABC , D is between A and C , E is between B and C and $\overline{DE}$ is parallel to $\overline{AC}$, then triangle ACB is similar to triangle DCE .	YES	NO
Th. 12.2	AAA Similarity	YES	NO
Th. 12.3	SSS Similarity	YES	NO
Th. 12.4	The perpendicular segment from the right angle of a right triangle to the hypotenuse divides the triangle into two other triangles, each similar to the given triangle.	YES	NO
Th. 12.5	PYTHAGOREAN THEOREM	YES	NO
Th. 12.6	The Converse of the Pythagorean Theorem. If in triangle ABC , $ AB = c$, $ BC = a$, $ CA = b$, and $c^2 = a^2 + b^2$, then triangle ABC is a right triangle with right angle at C .	YES	NO
Th. 12.7	Given three polygons of the same number of sides. If a polygon is similar to a second polygon, and the second polygon is similar to a third, then the first polygon is similar to the third.		

(OVER)

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<u>Postulate or Theorem</u>	<u>Title</u>	<u>Taken up in class?</u>	
Th. 13.1	A plane quadrilateral is a parallelogram if opposite sides are congruent.	YES	NO
Th. 13.2	A plane quadrilateral is a parallelogram if the diagonals bisect each other.	YES	NO
Th. 13.3	A plane quadrilateral is a parallelogram if the opposite angles are congruent.	YES	NO
Th. 13.4	A plane quadrilateral is a parallelogram if one pair of sides are both congruent and parallel.	YES	NO
Th. 13.5	In a triangle, the line segment joining the midpoints of two sides is (a) parallel to the third side, and (b) its length is one-half the length of the third side.	YES	NO
Th. 13.6	The diagonals of a trapezoid divide each other in the same ratio as the parallel sides.	YES	NO

(END)

INTEREST IN SCIENCE SCALE

Dear Student,

You will find here a list of statements that relate to science or mathematics activities. Read each statement carefully and try to recall if you were engaged in the activity at the beginning of the school year. Then, decide if you are now more interested, or less interested, or have not changed your feeling about each activity. This is not a test. You are only asked to give your honest opinion about each statement.

If you are more interested now in the activity, encircle 3 after the statement.

If your feelings have not changed, encircle 2.

If you are less interested now in the activity, encircle 1 after the statement.

Please answer all the statements you find here.

	Less Interested	No Change	More Interested
1. Reading science or mathematics books and magazines	1	2	3
2. Discussing topics related to science or mathematics with friends	1	2	3
3. Discussing our lessons in science or mathematics outside the classroom	1	2	3
4. Doing my homework in science or mathematics	1	2	3
5. Performing science or mathematics experiments	1	2	3
6. Discussing science or mathematics lesson with my teachers	1	2	3
7. Making projects in science or mathematics	1	2	3
8. Listening to class discussions in science or mathematics	1	2	3
9. Participating in or watching laboratory demonstrations	1	2	3
10. Watching TV shows and movies about science or mathematics	1	2	3
11. Discussing science or mathematics at home	1	2	3
12. Reading science or mathematics news in newspapers	1	2	3
13. Listening to science or mathematics news, information and programs over the radio	1	2	3

(OVER)

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	Less Interested	No Change	More Interested
14. Participating in science or mathematics field trips	1	2	3
15. Watching displays and posters in science or mathematics	1	2	3

Three questions are given below. Answer each question. If your answer is YES, encircle 3, if you are undecided, encircle 2, and if your answer is NO, encircle 1.

	No	Undecided	Yes
16. Has your overall attitude toward science or mathematics improved since the beginning of the school year?	1	2	3
17. Has your appreciation for the role played by science or mathematics in daily living improved since the beginning of the school year?	1	2	3
18. Do you give greater importance now to science or mathematics in community and national development?	1	2	3

For each of the items below, encircle the number that best describes how you feel about the science or mathematics course you are now taking.

19.	1 Very Boring	2 Boring	3 Interesting	4 Very Interesting
20.	1 Very Difficult	2 Difficult	3 Easy	4 Very Easy
21.	1 Worthless	2 Not Too Useful	3 Valuable	4 Very Valuable

Form I-1
FOR H.S. ADMINISTRATORS
(Schools of all 1975
participants)

UP-NSDB
PROJECT 7501 Ed.

NAME
(PLEASE PRINT) FAMILY FIRST MIDDLE INITIAL

PRESENT POSITION IN SCHOOL

1. Your school

- (a) Name of School: _____
- (b) Address of School: _____
- (c) Average yearly enrollment of the school (approximate):
_____ students
- (d) Number of teachers: _____ teachers
- (e) Kind of school (please check those that apply):
_____ Public
_____ Private

2. Your Educational Background

Degree	School	Year of Graduation	Major	Minor
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

3. Your Professional Background

(a) Positions Held

Position	Name of organization (e.g. name of school, office, etc.)	Major area of work or subject taught	Inclusive years
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(OVER)

- 2 -

(b) Seminars, Workshops, In-Service Training,
or Conferences attended

Title of Seminar, Workshop, or Con- ferences	Role (e.g. partici- pant, con- sultant, etc.)	Level (e.g. nat'l. local, etc.)	Duration (e.g. 1 week 1 day etc.)	Year Held
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

4. Please rank the factors that you consider desirable in the selection of science teachers who will participate in conferences, workshops, in-service training, etc. Highest rating is 1, next in importance is 2, and so on. Do not give equal ranks.

- _____ Teacher's efficiency
- _____ Teacher's length of service
- _____ Need of the school
- _____ Criteria provided by sponsoring agency
- _____ Age
- _____ Sex
- _____ Teacher's education qualification
- _____ College/University from which teacher graduated
- _____ Unmarried teachers
- _____ Others, please specify
- _____
- _____

5. Regarding the science teachers in your school, approximately what percent have:

- (a) Undergone summer in-service training
(two or more weeks duration) _____ %
- (b) Attended week-end workshops _____ %

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(c) Been given scholarships to pursue advance degree _____ %

(d) Used University of the Philippines, Science Education Center materials _____ %

6. Approximately how much was spent by your school for the acquisition of science equipment and supplies for:

1971 - 1972 P _____

1972 - 1973 P _____

1973 - 1974 P _____

1974 - 1975 P _____

7. Has your school received any donations in the form of science equipment and/or books from certain agencies?

_____ YES

_____ NO

If YES, please indicate the name(s) of the donor(s), e.g. NSDB, UNICEF, UPSEC, Asia Foundation, Ford Foundation, etc., and the approximate value (in pesos) of the donation(s).

Nature of donation*	Name of donor(s)	Value (in pesos)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

*Write E for equipment and B for books and printed matter.

8. Approximately what percent of your teachers in the following subject areas have undergone in service/workshop/conferences?

Social studies	_____ %
English	_____ %
Science	_____ %
Pilipino	_____ %
Physical Education	_____ %
Mathematics	_____ %
Vocational	_____ %

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9. How did you learn about the RSTC summer institute?

Please check those that apply.

- ☐ letter or telegram from RSTC director/staff.
- ☐ the RSTC director/staff came to tell us about it.
- ☐ we heard it from other schools.
- ☐ announcement in seminars, meetings, workshops.
- ☐ news item in the newspapers.
- ☐ radio announcement.
- ☐ communication from the Division office
- ☐ others (please specify) _____

10. To date, how many teachers has your school recommended for the RSTC summer institute? _____ teachers

11. Of these recommendees, how many have been selected by the RSTC? _____

12. On the average, how many teachers from your school are chosen by the RSTC every summer? _____

13. Of those who participated in the SSI, how many teachers are no longer connected in your school? _____

14. What incentives does your school offer to teacher trainees upon their return? Please check those that apply.

- ☐ raise in salary
- ☐ promotion in rank
- ☐ less teaching load
- ☐ given recognition (e.g. became a demonstration teacher)
- ☐ sent to another seminar/workshop
- ☐ prompt action on their requisition for supplies/materials
- ☐ immediate action on their textbook order
- ☐ serious consideration of their proposed curricular changes
- ☐ others (please specify) _____

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15. Besides professional growth of teacher trainees, which of the following benefits accrue to your school as a result of your participation in the SSI? Please check those that apply.

☐ added prestige
☐ improved quality of teaching
☐ change in science curricula
☐ recipient of free equipment
☐ textbooks/other books
☐ improvement/construction of science laboratories
☐ more funds for supplies and materials
☐ RSTC support of ECHO seminars
☐ RSTC assistance in recruiting teachers for your school
☐ others (please specify) _____

16. Do you plan to recommend some of your teachers next year to the RSTC SSI?

☐ YES
 ☐ NO

If NO, why? (Please check those that apply)

☐ We do not have qualified teachers.
☐ Our recommendees are usually turned down.
☐ Most, if not all, of the teachers we recommend transferred or resigned afterwards
☐ Our school does not get any real benefits from the teacher's training.
☐ others (please specify) _____

17. If some of your teacher trainees are no longer connected with your school, check below the reason(s) for their transfer/resignation. Otherwise, leave this item blank.

☐ higher salary elsewhere
☐ more attractive fringe benefits in other schools

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- ☐ a more challenging job elsewhere
☐ a more prestigious job elsewhere
☐ greater opportunities for advancement in the new job
☐ personal conflict with superiors
☐ misunderstanding with peers
☐ personal/family reasons
☐ others (please specify) _____

18. One condition for the school in training teachers at the RSTC is to procure books and equipment which the teacher/s will use upon return. To what extent has this condition been complied with? Please check one in each column.

	<u>Equipment</u>	<u>Books</u>
Procured almost all of those needed	_____	_____
About 3/4 of those needed	_____	_____
About 1/2 of those needed	_____	_____
About 1/4 of those needed	_____	_____
Very few (negligible) procured	_____	_____

UP-NSDB Project 7501 Ed.

1977

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